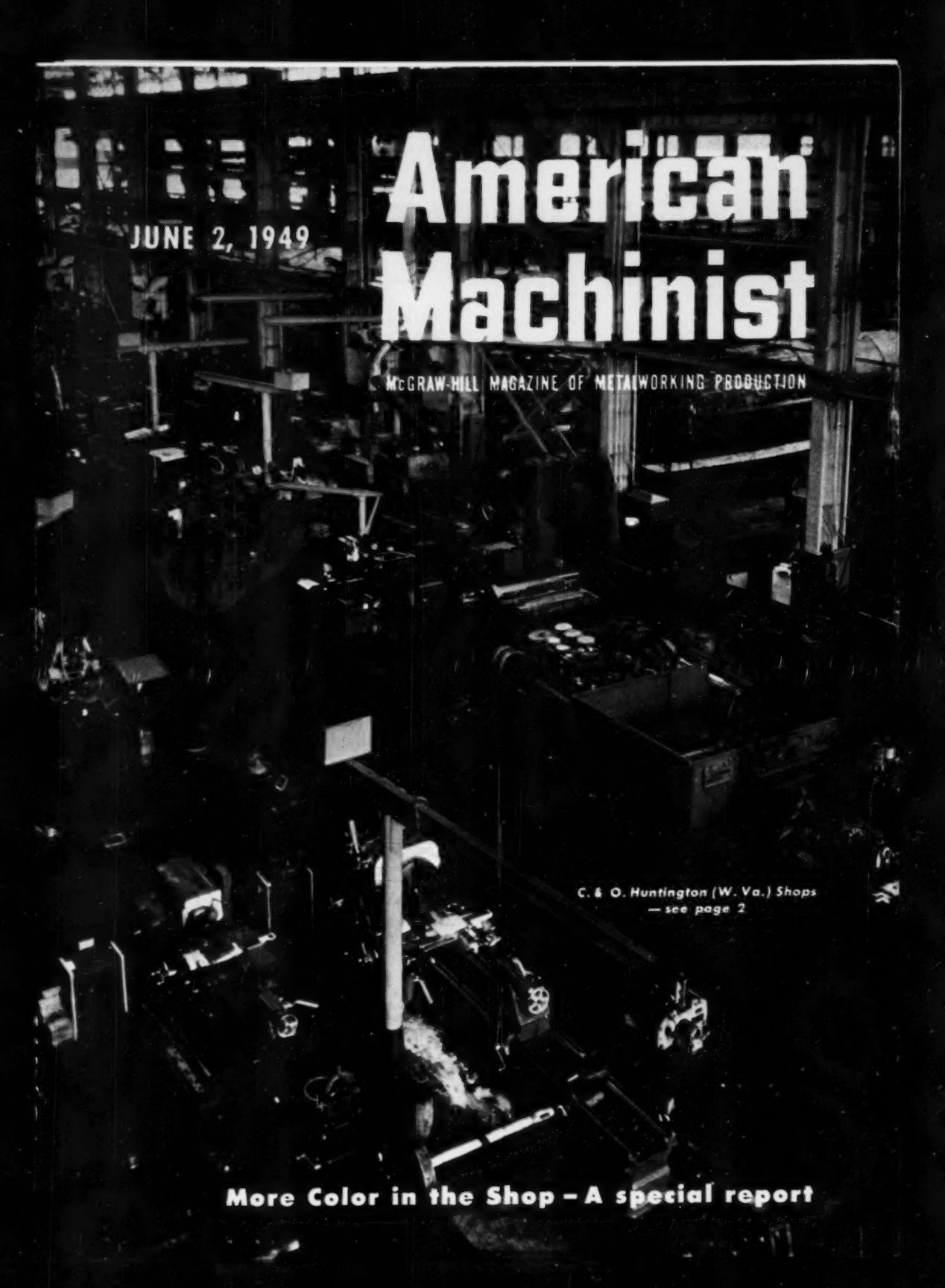

JUNE 2, 1949

American Machinist

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

C. & O. Huntington (W. Va.) Shops
— see page 2

More Color in the Shop – A special report

DOUBLE-END BORIZING

GIVES THREE-WAY ADVANTAGE

to Automotive Manufacturer

New Heald Bore-Matic

finishes water pump bodies... Faster

...at Lower Cost...with Greater Precision

The new Heald 222 Bore-Matic shown below has made a big difference in *production, economy,* and *accuracy,* for a large automotive manufacturer. This one machine now precision finishes oil pump bodies in a single high-speed automatic machine cycle—doing a job that formerly required two different operations on two machines.

The combination of operations, together with easier loading and unloading, and faster table rapid traverse, has greatly increased production and reduced the cost per part. What's more, the new Heald Bore-Matic produces more accurate work, with better finish—borizing to a tolerance of .0005 on diameter and .0002 on roundness.

Your nearest Heald representative can help you make savings like this on *your* production line. Why not get in touch with him today?

HEALD

PRECISION INTERNAL AND SURFACE GRINDERS

PRECISION BORE-MATIC FINISHING MACHINES

THE HEALD MACHINE COMPANY

Worcester 6, Mass.

Branch Offices in Chicago • Cleveland • Dayton • Detroit
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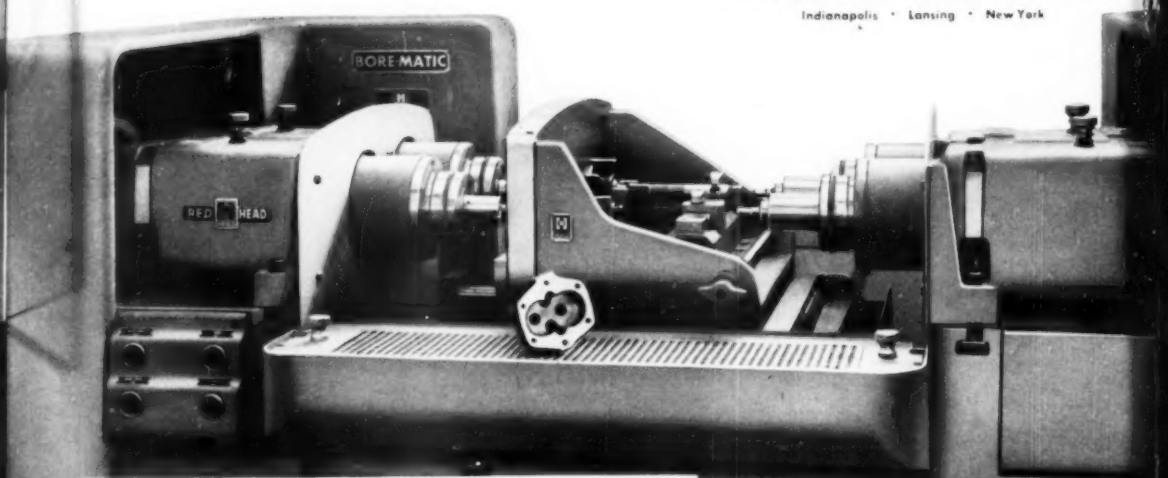

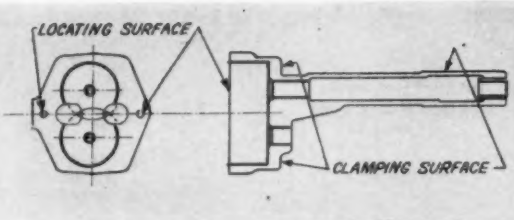

Drawing of oil pump bodies finished on machine shown above. Red lines indicate surfaces bored, faced and chamfered in one automatic cycle.

American Machinist

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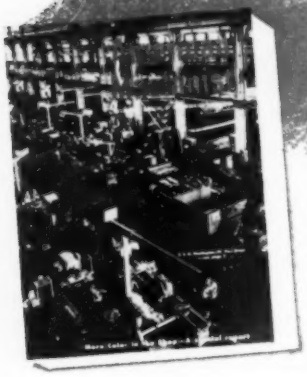


Our Cover . . . Three years ago, the laboratory of the Huntington (W. Va.) Shops, Chesapeake & Ohio Railroad, was painted in color. Shortly thereafter, the manufacturing toolroom at the other end of the same floor was similarly colored, then the turret-lathe department between. The idea proved so appealing, to management and workers alike, that it was soon applied to the entire locomotive repair shop.

This is the world's largest purely maintenance and repair shop for locomotives. It incorporates two large bays with a 3-story machine-shop leanto. Locomotives slated for teardown repair come in on a center track, entering an L at one end of the shop. They are stripped over a long pit, in readiness for lifting from trucks rebuilt locomotives are similarly assembled along two flanking long pits on the way out. Stripped locomotives are carried to one of 22 pits in the far bay (three others are now covered for use by the superheater gang), where scheduled repairs are completed. Tenders are spotted on tracks in the same bay for repairs, then stored in the yard for remating. The remaining area is taken up with material storage and special operations.

In the other of the two bays are heavy machine tools, with tracks for truck and tire work at the far end. Tools and cribs occupy the first floor of the leanto, locker rooms the second, and the lab, turret-lathe dept. and manufacturing toolroom the third.

Output of this shop is scheduled at 30 locomotives a month, but normal production is one per working day. Other buildings in the Huntington shops turn out 25 repaired railway coaches per month, while car repairs are handled at Russell Shops.

Details of the color scheme and a further picture of the manufacturing toolroom, are in our special report.

Color . . . Three years ago, we diffidently presented our first Special Report on Color in the Shop. Its reception was instantaneous—we found that the men of Metalworking, tough as they may seem, like color in their plants as well as in their neckties. Several we know about even paid us the compliment of repainting their shops in color and report eminently satisfactory results in terms of greater cleanliness and efficiency and bettered morale. Our fairly large stock of reprints also disappeared within six weeks, and requests for them still come in . . . These happenings have encouraged us to attempt a second. Such a report is ultra-expensive to produce, but is, we believe, justified by your acceptance of the earlier one. Included are a number of case-study pictures and two detailed cases, those of the Staples Company in Cincinnati and of the Purdue Mechanical Laboratories. . . . Reprints will be available.

For Tool Men . . . This issue brings several features for men who worry about tooling . . . Walter J. Mahany, production vice-president of Southern States Iron Roofing Co., explains a progressive die that cut four operations to one in making turpentine gutters, includes some ideas that you can use . . . Wm. F. Stoeffhaus, vice-president of Arnold, Schwinn & Co., shows how abrasive belts increase production and cut costs on bicycle parts . . . There's also a story on gas and gun welding fixtures at American Central, another on die fences at G. E. X-ray, still another on a new cam-operated machine, yet another on drilling the 96-in. outlet gates for Shasta Dam. Spider and cam guiding cut a 48-hr. job to a 6-hr. one at the Sunnyvale (Calif.) plant of Westinghouse . . . And H. P. Bailey goes on with portable tools.

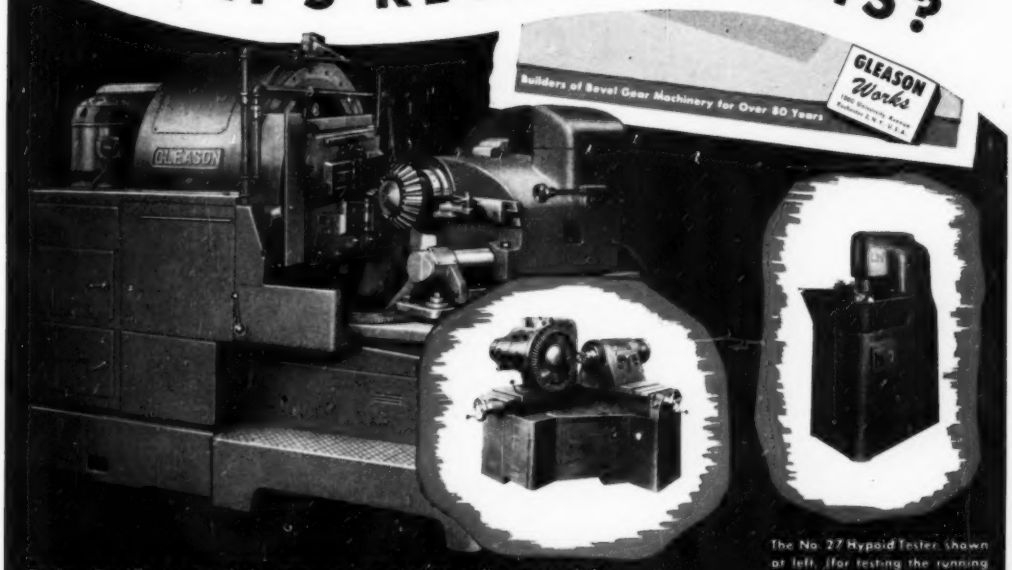
Coming . . . June 16 *A.M.* will include a Special Report on Mill Product Terminology (of interest to every user of sheet and plate metals), details on induction soldering, on welding a wheel, on handling apprentices. For small-shop men are two articles, one on how the small shop can make money, the other on planning and routing variety production. For tool engineers, there are articles on die clearances, broaching fixtures, cutting gear blanks, and measuring acme threads. H. P. Bailey continues his series on portable tools and our cover is graced with the first full-color Kodachrome of that spectacular sight, a friction circular saw slicing a 24-in. I-beam in 12 sec.

CONSULTANT . . . **Tyler G. Hicks is a graduate mechanical engineer who spent several years in the merchant marine. He sailed as everything from wiper to first assistant—but came ashore (as many good sailors do) to operate stationary power plants for several years after his marriage.**

During this period, he became particularly interested in applying machine tools to plant maintenance and production. This led him to his present position as a member of a consulting engineering firm, where he specializes in industrial-plant design and operation. The intersection charts for press-fit forces (A.M. Reference Book Sheets, May 5) resulted from his investigation of presses for production of aluminum and non-ferrous metal bars and shapes. His hobbies are boating, golf, rifle shooting, and last but not least, his family.

In August, 1946, Gleasons announced localized tooth bearing in straight bevel gears and called this new development "Coniflex."*

ARE YOU EQUIPPED FOR TODAY'S REQUIREMENTS?



Today, Coniflex gears have proven superior to ordinary straight bevels. They are easier to assemble, operate smoother, and have wider operating tolerances. Coniflex gears, as cut on the No. 24A Straight Bevel Generator, are providing outstanding operation in power shovels and cranes, road machinery, ordnance and mining equipment, steel mill table drives and other heavy equipment.

For large gears, investigate the Gleason No. 24A Straight Bevel Generator designed to cut the new Straight Bevels, *Coniflex*.

* Coniflex—Straight bevels with localized tooth bearing. Reg. U. S. Pat. Off.

The No. 27 Hypoid Tester, shown at left, (for testing the running qualities) and the No. 12 Generator Tool Sharpener, shown above, (to sharpen the cutting tools) complete the unit for complete production of Coniflex gears

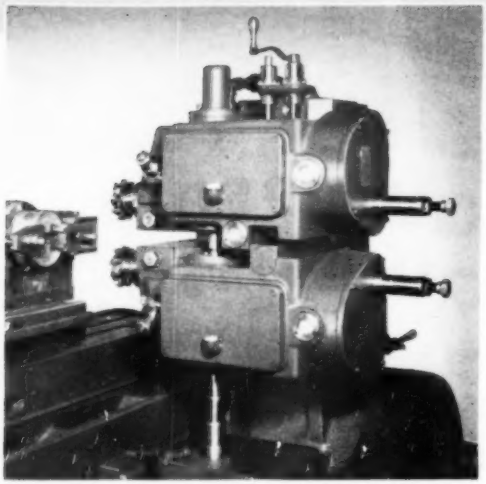
GLEASON Works
1000 University Avenue
Rochester 3, N. Y., U. S. A.

Builders of Bevel Gear Machinery for Over Eighty Years

PRE-FAB HYDROMATIC UNITS

Give you a choice of

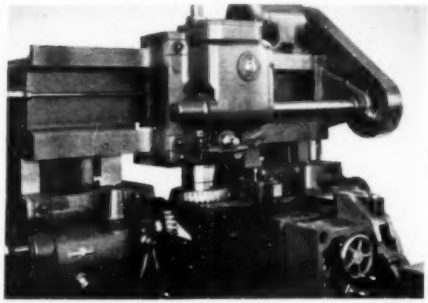
SPINDLE HEAD ARRANGEMENTS



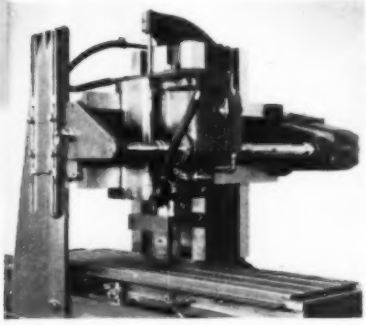
Close-coupled spindle carriers, above, replace the standard spindle carrier on a No. 34-36 Plain Hydromatic. In one pass two opposite slots are milled in aluminum pistons at a rate of 41 per hour.

New methods hold far more attraction to management when standard or semistandard equipment can be used. In general, capital investment is lower, and if the need arises, the machines can readily be refitted and used for other purposes. These two outstanding advantages are offered by CINCINNATI Hydromatic Milling Machines. Built up on standard plain and duplex styles, these machines are designed to give you a selection of standard and complementary units such as:

1. Close-coupled spindle carriers, illustrated at left
2. Vertical spindle heads, single or close-coupled
3. Fixed height or adjustable bridge type rail support (below) for vertical spindle heads
4. Extra wide bed for increased capacity



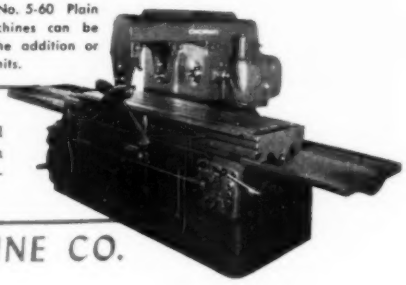
The illustration above shows a vertical spindle carrier on a fixed height rail applied to a No. 45-60 Duplex Hydromatic. This equipment mills the top, bottom, and pad on cylinder blocks.



Left: Vertical spindle carrier on a variable height rail with outboard support, converts this No. 46-72 Hydromatic into a general-purpose, automatic cycle vertical milling machine for large work.

CINCINNATI

Right: Standard CINCINNATI No. 5-60 Plain Hydromatic Miller. These machines can be changed to suit the job by the addition or substitution of many pre-fab units.



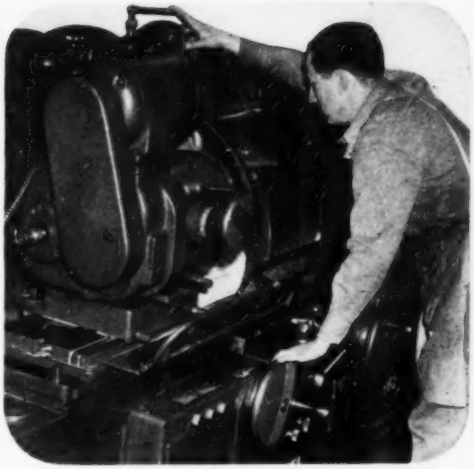
Perhaps the milling operations on parts in your shop could be combined at a big saving. The standard and complementary unit construction plan of CINCINNATI Hydromatics offers many possibilities. May we send engineering data? Ask for catalog M-1372-1.

THE CINCINNATI MILLING MACHINE CO.

CINCINNATI 9, OHIO, U. S. A.

MILLING MACHINES • BROACHING MACHINES • CUTTER SHARPENING MACHINES
FLAME HARDENING MACHINES • OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID

The internal grinding head is ready for work in a minute or less. In the illustration, the hole in a drill jig bushing is being ground to accurate size.



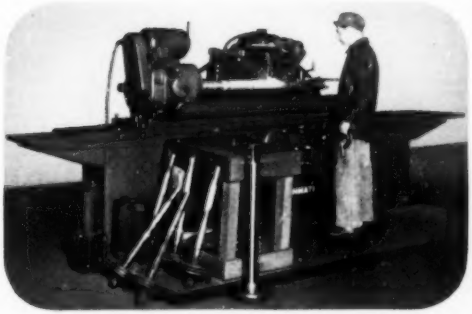
Grinding an exceptionally short part. Work of this type can be traverse ground on CINCINNATI FILMATIC Hydraulic Universals, because dog controlled table reciprocation with pick feed can be set as short as $\frac{3}{32}$".

FILMATIC

To make a long ~~story~~ SETUP short...

FILMATIC UNIVERSALS

SAVE TIME IN YOUR SHOP



Typical shop shot, showing a CINCINNATI FILMATIC 14" Hydraulic Universal in action and the work assigned to it. Manufacturing quantities vary from one to five parts.

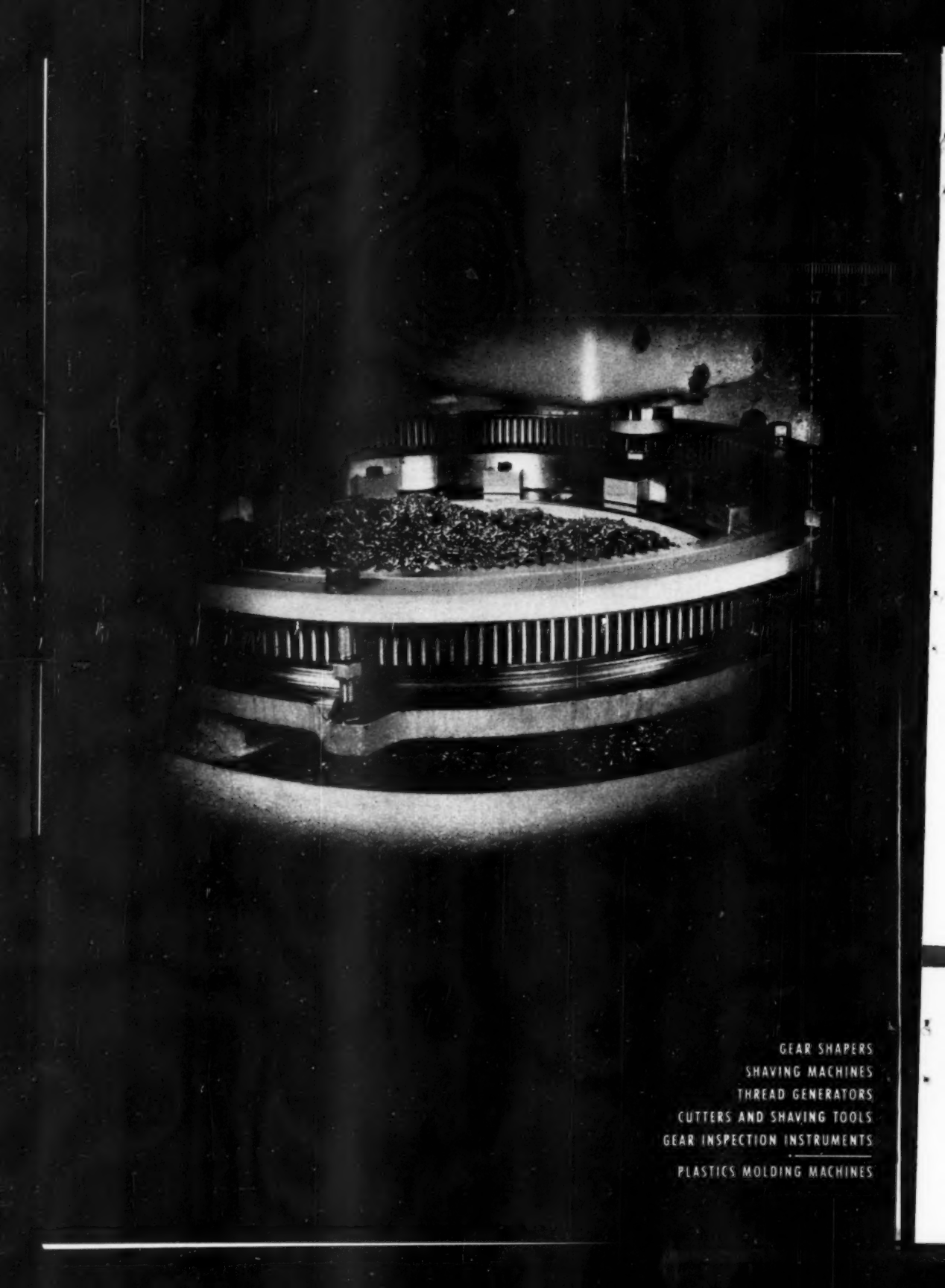
● How long does it take to get going on small lots? Whatever the answer is, set-up time constitutes one of the major elements in the cost of small quantity precision toolroom grinding. Reduce set-up time, and costs go down fast. You can be sure of brief setups on CINCINNATI FILMATIC Hydraulic Universals, for they have many features of value in small quantity production. To mention only three: hinged type internal grinding attachment, always on the job; Filmatic spindle bearings, never require adjustment; lathe standard spindle nose on headstock. ¶ The photographs show three setups which take advantage of CINCINNATI Hydraulic Universals' many features. Others have just as much value in reducing costs. All of them, plus complete specifications, are contained in these catalogs: 12" machine, G-486-4; 14", 16" and 18" machines, G-474-3. Send for copies.

CINCINNATI

CINCINNATI GRINDERS INCORPORATED

CINCINNATI 9, OHIO, U. S. A.

CENTER TYPE GRINDING MACHINES • CENTERLESS LAPPING MACHINES • CENTERLESS GRINDING MACHINES



GEAR SHAPERS
SHAVING MACHINES
THREAD GENERATORS
CUTTERS AND SHAVING TOOLS
GEAR INSPECTION INSTRUMENTS

PLASTICS MOLDING MACHINES

New Mastery of Costs on BIG GEARS

Here is a new Fellows machine . . . the 36-inch Gear Shaper . . . the rigid construction of which permits the taking of heavier cuts that set a new production pace, and a new and lower standard of costs in gear cutting.

A case in point is the large combined external and internal gear illustrated. Feeds as high as .0225" per stroke at 58 strokes per minute prove the ability of this machine to take fast, heavy, roughing cuts. A study of the tabulation below should whet the interest of those seeking to lower their costs in gear cutting.

	External Gear	Internal Gear
Material	SAE 3250 52 R-C	SAE 3250 52 R-C
Pitch diameter (inches)	37.166	34.666
No. of teeth	223	208
Diametral pitch	6	6
Pressure angle	20°	20°
Face width (inches)	2¼	1¾
Roughing cut (58 strokes per min.)	.0225" per stroke	.0225" per stroke
Finish cut (58 strokes per min.)	.027" per stroke	.027" per stroke (66 STROKES PER MINUTE)
TOTAL PRODUCTION TIME	2 hrs. 48 min. 45 sec.	2 hrs. 15 min.

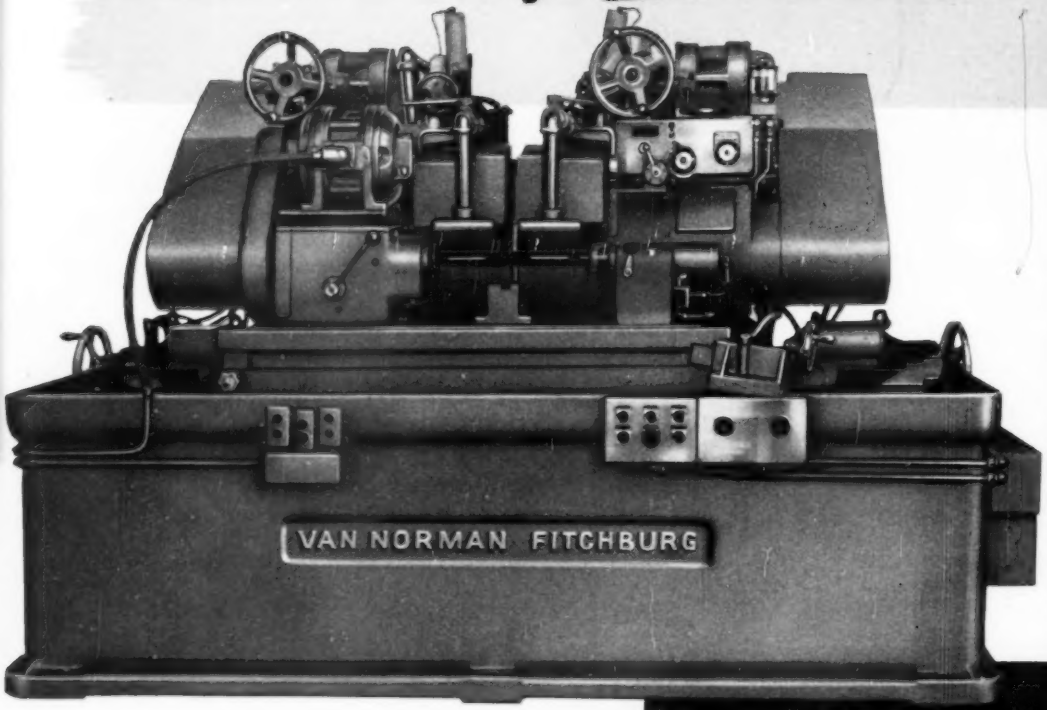
We have even more data to offer in evidence of the remarkable production possibilities of the 36-inch Gear Shaper. Call or write our nearest office.

Fellows

THE FELLOWS GEAR SHAPER COMPANY • Head Office and Export Department • 78 River Street, Springfield, Vermont.
Branch Offices: 616 Fisher Bldg., Detroit 2 • 640 West Town Office Bldg., Chicago 12 • 7706 Empire State Bldg., New York 1.

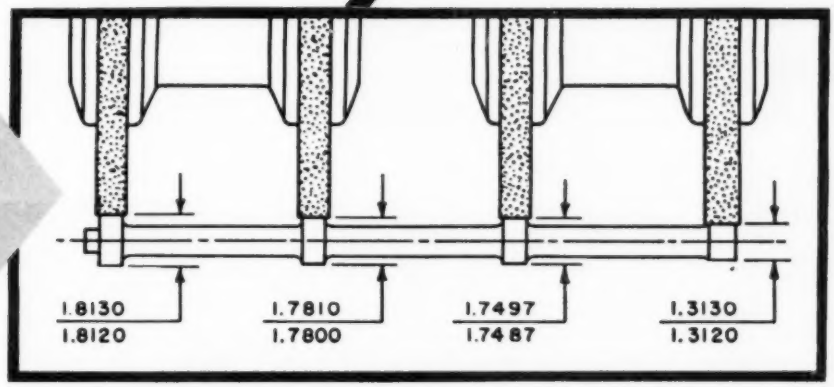
Van Norman

Automatically Grinds Four Crankshaft Bearings SIMULTANEOUSLY



VAN

Fitchburg Grinder



If you want to cut grinding costs . . . if you want to get out more pieces . . . if you want to cut tooling costs — then Van Norman Fitchburg Cylindrical Grinders are the machines for you.

Typical of the low cost-per-piece mass production grinding performed on Van Norman Fitchburg Grinders is the illustration above where four camshaft bearings are ground simultaneously.

Each of the two standard Bowgage Wheelheads, one right-hand and the other left-hand, carries two spaced wheels on a wheel center. After the workpiece is loaded, the operator merely pushes *one* button and all four camshaft bearings are ground at the same time. All movements and correct sizing are completely automatic. The work stops rotating automatically, practically instantly, when the wheels withdraw. The operator unloads and loads the grinder and the next piece is ground.

If you have a mass production grinding problem, Van Norman will design and build a Van Norman Fitchburg Grinder that will cut costs for you, too. All we need do is simply take one or more Van Norman Fitchburg Bowgage Wheelheads . . . completely automatic integral grinding units with gauging, rough and finish feeds, and automatic cycling with rapid traverse . . . and mount them on a base best suited for your jobs.

Whether it's a standard or special purpose machine, it will pay you to investigate Van Norman Fitchburg Cylindrical Grinders.

NORMAN COMPANY

SPRINGFIELD 7, MASSACHUSETTS

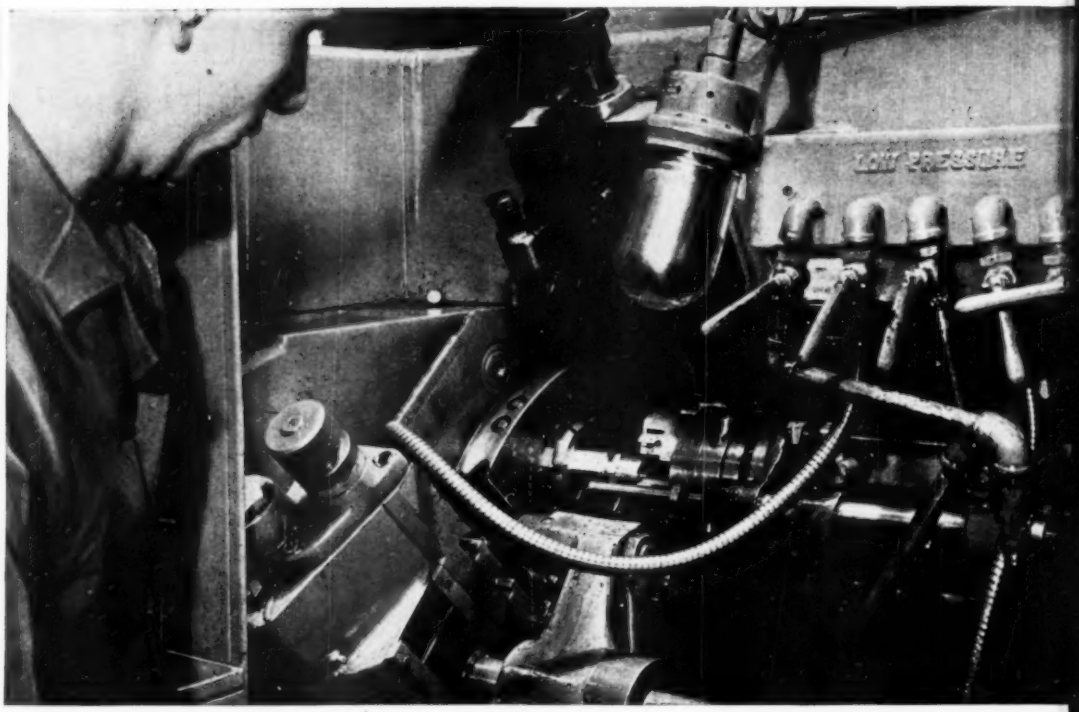
"It pays to Van Normanize"

Designed for PRODUCTION,

LANDEX HEADS.....FOR AUTOMATIC

LANDIS REG. U.S. PAT. OFF. TRADE-MARK

• In the illustration, the Type J LANDEX Heat Treated Head is being used on an automatic screw machine to produce 15/16" diameter 16 pitch threads on stainless steel hex head bushings.



The LANDIS CHASER

LANDIS

WAYNESBORO

PRECISION, & ECONOMY

& SEMI-AUTOMATIC SCREW MACHINES

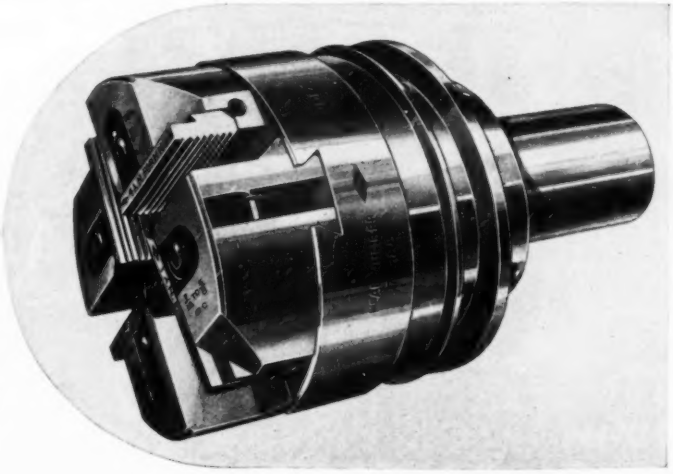
Write for Bulletins

F-90—Heat-Treated

F-80—Hardened and Ground

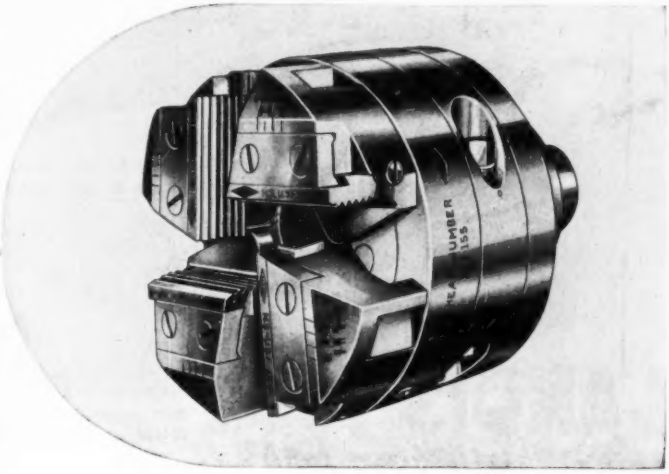
LANDEX Heads are built of tough alloy steel, and have the sturdy, rigid construction so essential for tools to be used for threading stainless steel parts on a high production basis.

Free cutting action of the threading tool is of utmost importance when producing threads on stainless steel and other similar materials. The Landis Tangential Chaser, used exclusively in the LANDEX and other Landis Heads, provides the free cutting action which assures smooth finished threads and the long tool life which results in minimum threading cost.



ABOVE: *the LANDEX Hardened and Ground Head.*

BELOW: *the LANDEX Heat-Treated Head.*



MACHINE COMPANY

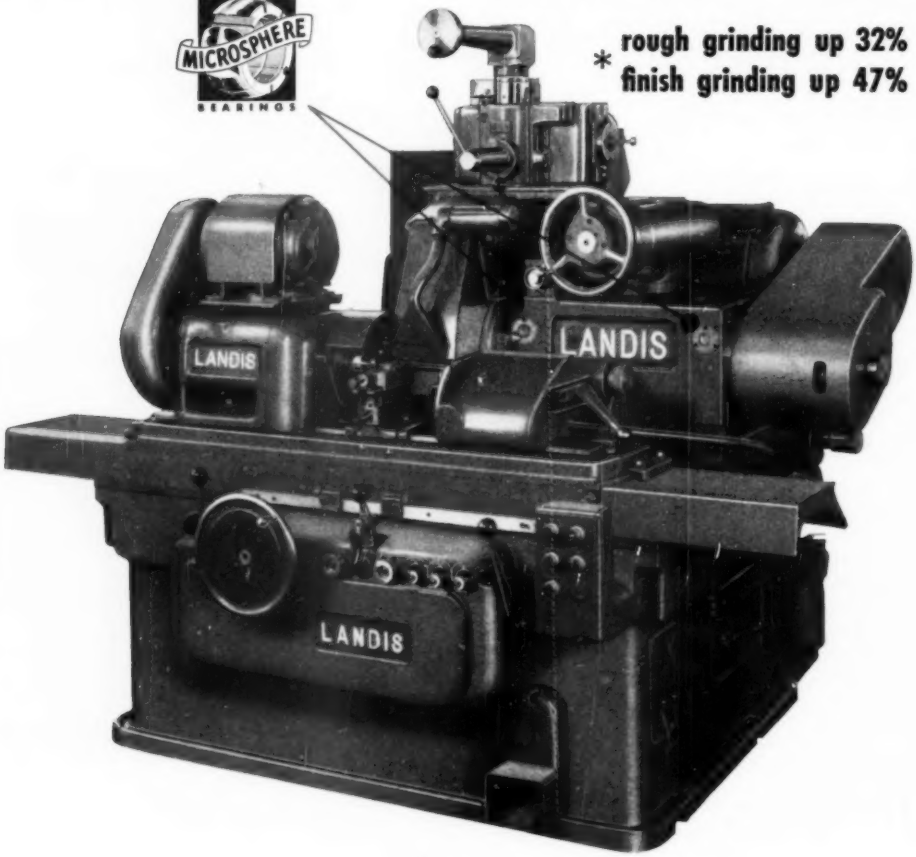
PENNSYLVANIA • • • U. S. A.

how a modern LANDIS TOOL grinder

REDUCED COSTS

EQUIPPED WITH MICROSPHERE BEARINGS

* rough grinding up 32%
finish grinding up 47%

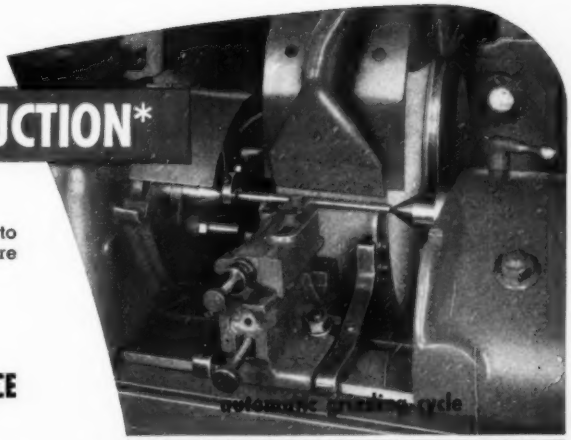


LANDIS TOOL 10" x 18" Type CH Plain Hydraulic Cylindrical Grinder With Special Tooling.

LANDIS TOOL *Precision Grinders*

LANDIS TOOL Engineered Grinding Service will help you with your grinding problems. Production estimates and recommendations will be made on the basis of your blueprints.

INCREASED PRODUCTION*



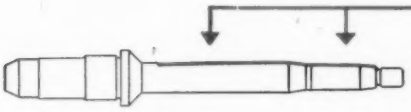
An electric motor manufacturer wanted to increase production of motor armature shafts and reduce grinding costs.

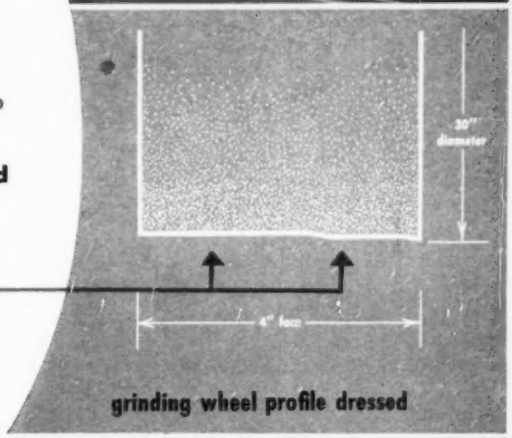
LANDIS TOOL ENGINEERED GRINDING SERVICE SOLVED THE PROBLEM

by a standard cylindrical grinder tooled for semi-automatic profile grinding.

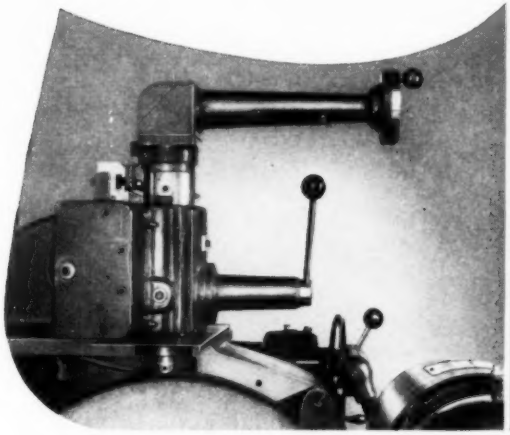
Three tapers and one diameter ground at one time by infeed grinding.

production	rough grind	finish grind
Stock Removal	.012"	.008"
Production per hour	140	162

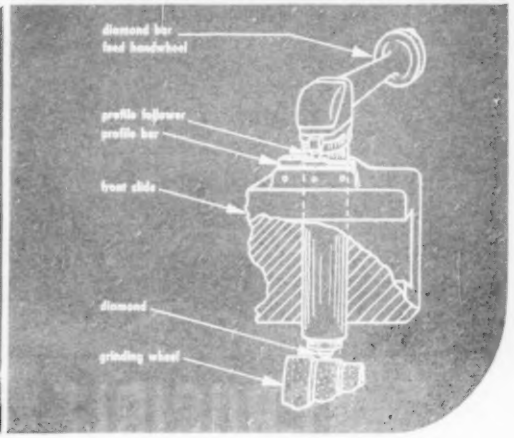




grinding wheel profile dressed



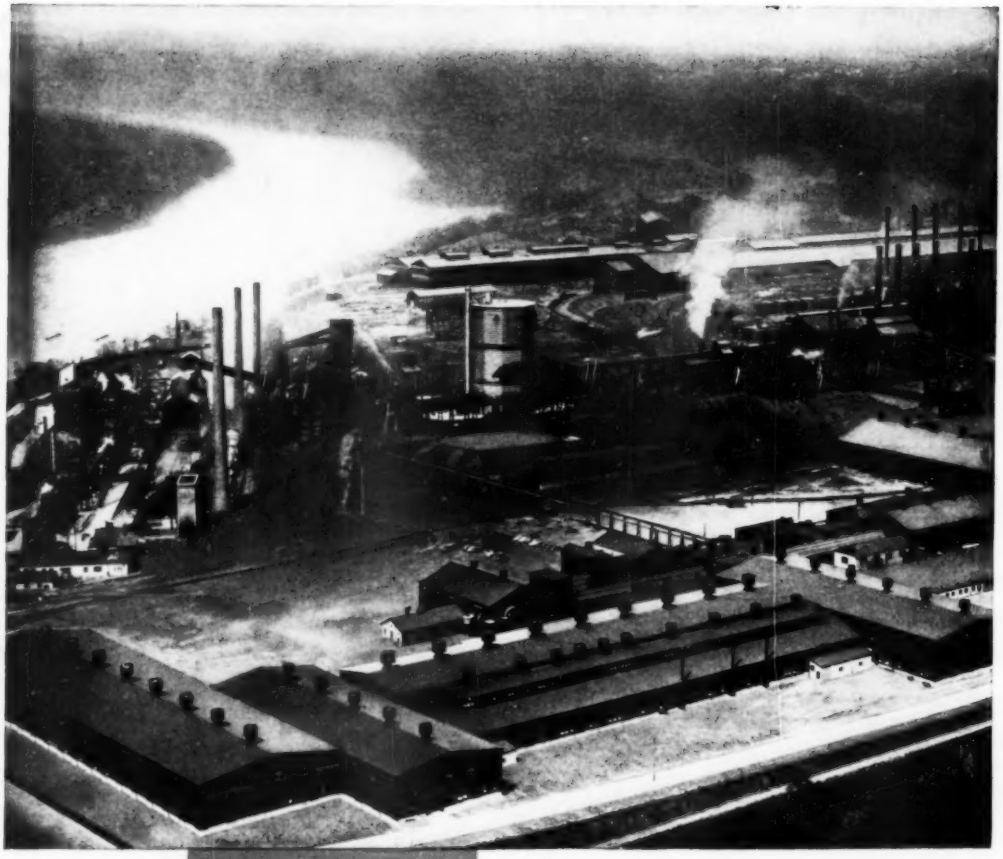
hydraulic wheel dresser *Fender mounted hydraulic dresser cuts dressing time Gives choice of profile or straight dressing.*



profile dressing *Profile bar insures accurate and rapid step dressing of wheel. Other profiles can be dressed by changing the profile bar.*

LANDIS TOOL COMPANY • WAYNESBORO, PA.

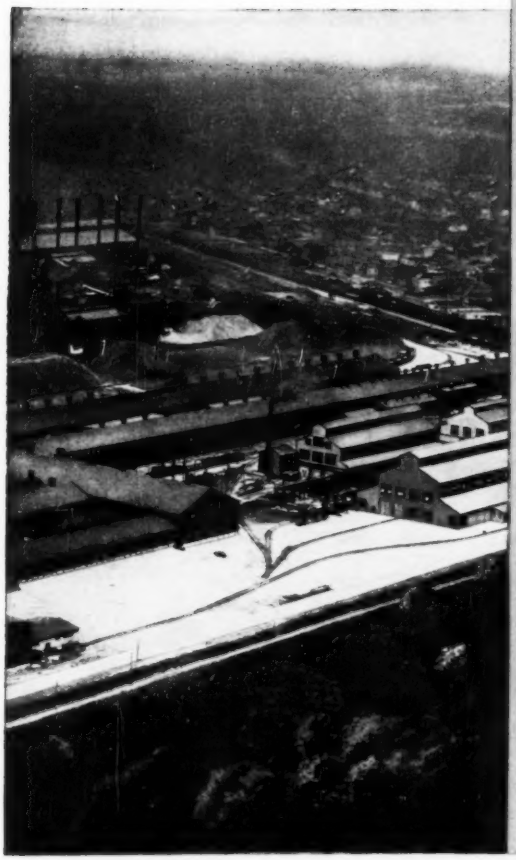
$18,000,000 set of tools for the



CRUCIBLE first name in special purpose steels

hot and cold rolled **STAINLESS SHEET AND STRIP**

MASTER mechanic



When a *master* mechanic gets new tools, expect master workmanship. And when CRUCIBLE, *master* producer of tool, alloy and specialty steels, designs an $18,000,000 mill specifically for hot and cold rolled stainless sheet and strip, you can rightly expect the best that modern facilities and generations of *specialty product* leadership can provide.

For here, at CRUCIBLE'S new Midland Mill, is an entirely new concept in stainless sheet and strip production . . . here, for the first time, stainless sheet and strip are made as *specialty products*, by specialty production methods, in a mill built from the ground up for this purpose. Here at Midland are no mills designed for carbon steel production, re-powered for the heavier duty of rolling stainless, but $18,000,000 worth of *brand new* equipment, designed and built for *modern* hot and cold rolling of stainless steel — in widths from ½" to 50" inclusive, and in all gauges, grades and finishes.

This is important news to every designer and fabricator of stainless steel products. For CRUCIBLE, pioneer in stainless steel since its inception, now offers *a completely integrated* line—sheet, strip, plates, bars, tubing, wire, forgings and castings.

In short, you can turn with every confidence to the *first* name in special purpose steels for *every* form of stainless. One of the largest and most highly specialized technical forces in the steel industry is at your service for specific application advice. And there are comprehensive data sheets available for all grades. Your inquiry will be welcomed.

CRUCIBLE STEEL COMPANY OF AMERICA, Chrysler Building, 405 Lexington Ave., New York 17, N.Y.
Branches, Warehouses, and Distributors in Principal Cities. Consult your Telephone Directory or Thomas' Register for Nearest Office.
HIGH SPEED • TOOL • STAINLESS • ALLOY • MACHINERY • SPECIAL PURPOSE STEEL

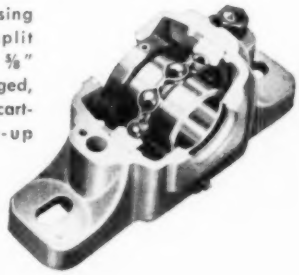
LINK-BELT offers the "QUALITY QUINTET" in BALL AND ROLLER BEARINGS

Series 200 ball bearings

Solid or split housing pillow blocks (solid shown) for shafts 5/8" to 3 15/16"—also flanged, take-up, and hanger blocks.

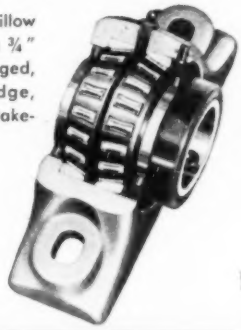
Series 300 ball bearings

Solid or split housing pillow blocks (split shown) for shafts 5/8" to 3 15/16". Also flanged, flanged cartridge, cartridge and take-up blocks.



Series 400 roller bearings

Solid housing pillow blocks for shafts 3/4" to 4"—also flanged, flanged cartridge, cartridge and take-up blocks.



Series 6800-6900 roller bearings

Split housing pillow blocks with adapter sleeves for mounting on commercial shafting of 1 7/16" to 6 15/16" diameter.

Split housing pillow blocks for press-fit on precision-turned shafting of 1.7700" to 7.4800" diameter.

Series 7800-7900 roller bearings

SEND FOR CATALOGS!

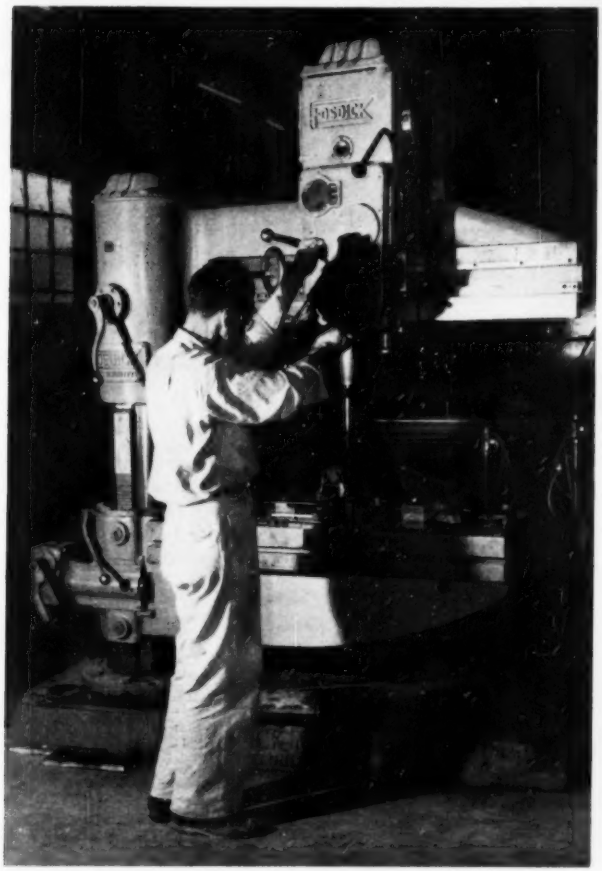
LINK-BELT COMPANY

Indianapolis 6, Chicago 9, Philadelphia 40, Atlanta, Dallas 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8. Distributors in Principal Cities. 11.485

LINK-BELT BALL AND ROLLER BEARINGS

Fills a void in Sensitive Production

FOSDICK Sensitive RADIAL



The installation above was taken in the plant of Vernon Kilus, Los Angeles, California.

● In industrial centers from Maine to California and from Michigan to Texas you'll find FOSDICK Sensitive RADIALS in operation.

The practical utility of this new Fosdick machine for handling sensitive drilling operations has given it a wide acceptance in a period of less than two years.

The sturdy one piece column, the arm at fixed height, the table adjustable on the column and the conventional base are features that add to its versatility. For example, both the arm and the table swing in an arc of 360°.

Note also that the operator from a normal operating position can easily feed the tool into the work or throw in power feed when desired. To provide a more convenient means of hand feeding the spindle a ratchet handle is provided.

Spindle speeds as low as 60 R.P.M. and as high as 3600 R.P.M. are available and four feeds are obtained through a direct reading lever on the right hand side of the head.

If you need a truly versatile machine for handling your sensitive operations investigate the FOSDICK Sensitive RADIAL.

Full descriptive bulletin available—write for Fosdick Sensitive Radial Bulletin S R A.

FOSDICK MACHINE TOOL *Company*
CINCINNATI 23, OHIO

Now Is the Time to Cut

Skillful Engineering *backed by* Progressive Research

Adequate Stocks • • Strategically Located

Grinding Wheel Costs . . .

Norton Product "Know-How" and Application "Know-How" Can Do It for You

Now, more than ever, it is absolutely essential to get grinding, polishing and other abrasive costs down to rock bottom—down below that dangerously high "break-even" point. *And Norton "know-how" can help you do it.*

Skillful Engineering Backed by Progressive Research

Norton abrasive engineers are highly trained men—experts who can come right into your plant and specify a cost-cutting grinding wheel or abrasive for each of your jobs. Back of them are the engineers from the Worcester plant, each a specialist on a particular type of grinding or use of abrasives. And supplementing these Norton engineers there are more than 2000 distributor men the country over—a large percentage of them factory-trained by Norton.

To make sure that Norton engineers have available the very best grinding wheels and other abrasive products to solve your problems, a staff of 135 scientists and technicians is constantly at work in the Norton Research Laboratories. It is the efforts of these men which have brought forth the many important Norton developments such as 32 ALUNDUM abrasive—the sensational, single crystal abrasive which is cutting grinding costs in thousands of plants.

Adequate Stocks—Strategically Located

When the correct wheels for your jobs have been determined, they are handy to you—on the shelves of Norton distributors in over 225 cities of the United States. And these local stocks are carefully selected to meet the particular needs of each individual area. Back of these distributor stocks are the Norton branch warehouses in five important industrial centers and supporting them are the gigantic stock rooms at the mile-long Worcester plant.

Take advantage of Norton "know-how" to cut your abrasive costs. Call in your Norton abrasive engineer or your local Norton distributor—you will find him listed under "grinding wheels" in your classified telephone directory.

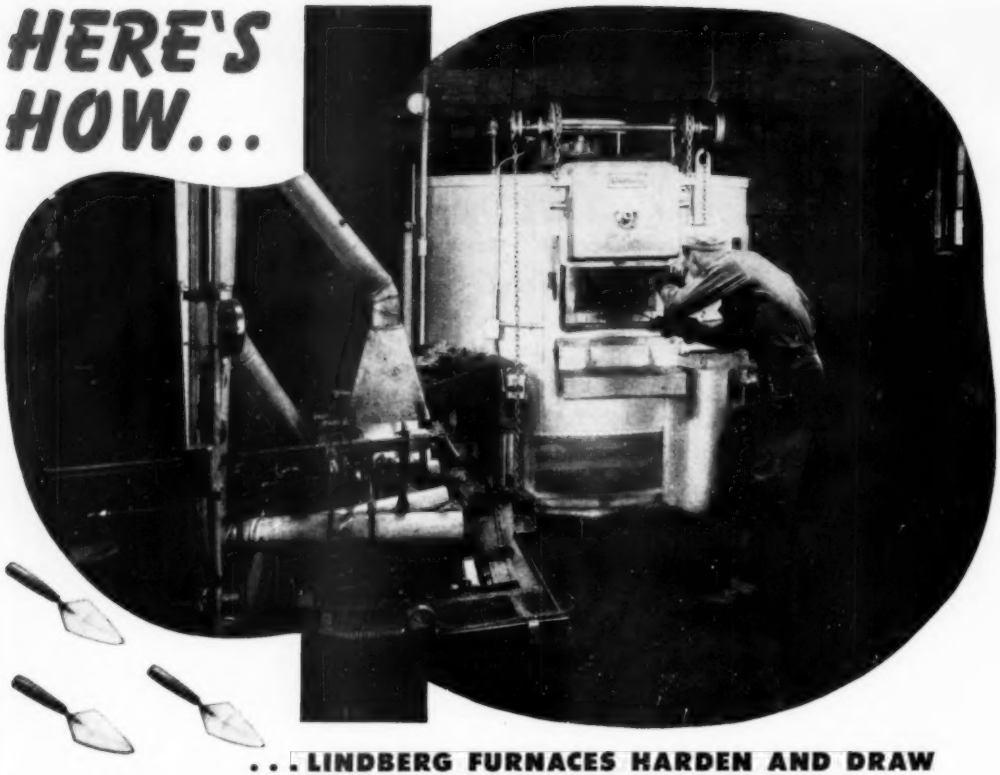
NORTON COMPANY, WORCESTER 6, MASS.

(Behr-Manning, Troy, New York, is a Division of Norton Company)

W-1245

NORTON ABRASIVES

HERE'S HOW...



. . . LINDBERG FURNACES HARDEN AND DRAW TWICE AS MANY TROWELS DAILY and . . .

. . . Increase production per man hour by 5 times . . . Reduce fuel cost ⅓ . . . Increase production per sq. ft. of floor space 60%

Marshalltown Trowel Company, well known trowel manufacturers of Marshalltown, Iowa, installed a new Lindberg Rotary Hearth Hydryzing Furnace and a new Lindberg Gas Fired Cyclone Drawing Furnace. Check this "Before and After" story of fuel cost reduction—production increase and uniformity improvement.

NOTE: Figures cover hardening and drawing production on just one size trowel. This same equipment is used for other types and sizes of trowels—with similar improvements in production, fuel costs, etc.

RALPH W. WILLIAMS

Production Manager of Marshalltown Trowel Company says: "We installed this equipment about 12 months ago, and our savings already are more than half the cost of the furnaces. At this rate we'll have the furnaces paid for in another year. We also find that these new furnaces make working conditions much cooler and cleaner."

BEFORE	AFTER
Equipment Used One open oil fired semi-muffle furnace 24" x 60" and one oil fired draw straightening furnace.	**Equipment Used** One Lindberg Rotary Hearth Hydryzing furnace (48" dia.) and one Gas Fired Drawing furnace (16" x 24").
Fuel Cost Per Trowel $.0050	**Fuel Cost Per Trowel** $.0032
Production Per Man Hour 50 Trowels	**Production Per Man Hour** 250 Trowels
Production Sq. Ft. Fl. Space Per Day 23 Trowels	**Production Sq. Ft. Fl. Space Per Day** 37 Trowels
% Of Work Necessary To Re-Heat-Treat To Insure Perfect Hardness Uniformity. 7% hardening and 6% drawing	**% Of Work Necessary To Re-Heat-Treat To Insure Perfect Hardness Uniformity.** No re-runs

LINDBERG ENGINEERING CO. 2445 W. Hubbard St., Chicago 12, Ill.

LINDBERG FURNACES

Adds Years of SERVICE...

Yes, the patented double low-hung spindle drive adds years of effective service to "AMERICAN" Hole Wizard Radial Drills—and in addition insures smooth holes and more holes per drill grind

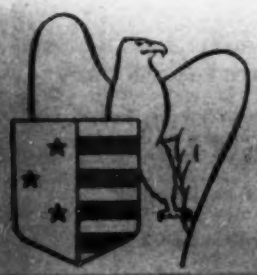
This patented spindle construction provides two drives—one through a large helical gear for the low-speed range and one through a smaller gear for the high-speed range This division of service between one large diameter and one smaller diameter gear results in low gear tooth pressures when performing large diameter drilling and boring operations through the low-speed range and low gear velocities when drilling at high speeds through the high-speed range. This is an ideal drive and unmistakably adds up to a longer and more effective life for the spindle transmission.

However, this is only part of the story. This drive is located at the bottom of the head as close as possible to the work, definitely reducing the torsional stress on the spindle, thus imparting a smooth action to it which in turn results in smooth, high quality work and prolongs the cutting edges of the tool.

The spindle itself is made of NITRALLOY steel as is also the spindle sleeve and both are nitrided for extreme surface hardness, the spindle being ground and the sleeve honed to very close limits. The spindle and sleeve are Timken mounted with an adjustment for wear This construction, combined with thorough lubrication by filtered oil, insures long life, maintained accuracy and low maintenance.

Cost-minded officials select "AMERICAN" Radials

Will gladly send literature



THE AMERICAN TOOL WORKS CO.

Cincinnati, Ohio, U. S. A.

Lathes and Radial Drills

Here's what they tell us
ABOUT THIS NEW DRILL:

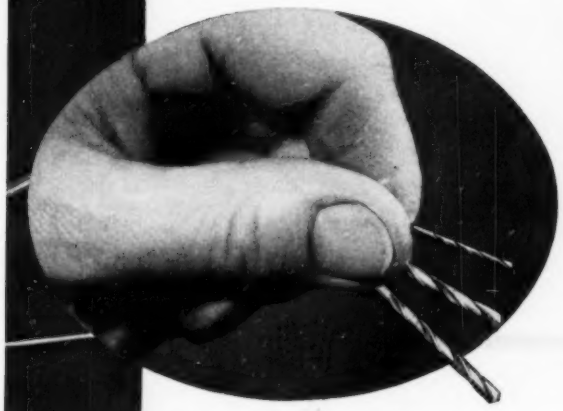
"... we estimate it has drilled a total of 6682", *or 3100 times its length!*"

"... after about 75 hours, the drill was reground, put back in the machine, *and is still running!*"

"... 133,850 pieces in No. 8620 Steel with 1 dozen G-Style Drills!"

...the "AMBORE" DRILL

that gives 50% More Production



HERE IT IS! Here's the *new* Morse Drill ... with its new thousand-dollar name ... ... the "AMBORE" ... *the drill of fewest changeovers.*

Here is the first really big news in drills since Stephen Morse produced the first twist drill. This new drill is *ground from the solid* ... with heavier web, constant angle, and wider flutes that clear chips in a faster, easier flow. And then, finally, it's processed by a *New Morse Method* that gives this drill more strength, toughness, and flexibility than any other drill now made ... to withstand the higher speeds of today's production demands.

Proved by exhaustive field tests, this new Morse Drill is available to you ... *now* ... in 59 sizes from No. 80-30 to 1/64-1/8" ... from your own Morse-Franchised Distributor. Call him *today* on *your* problem.

SOLD EXCLUSIVELY THROUGH MORSE-FRANCHISED DISTRIBUTORS

Accuracy, Quality, Uniformity: the MORSE Code of Cutting-Tool Manufacture

MORSE TWIST DRILL & MACHINE COMPANY

NEW BEDFORD, MASSACHUSETTS

A DIVISION OF VAN NORMAN COMPANY

BRANCH WAREHOUSES: NEW YORK, DETROIT, CHICAGO, DALLAS, SAN FRANCISCO

All yours...

this "gold mine" of GAGING INFORMATION FROM Accuracy Headquarters

CATALOG NO. 11

contains the complete listing of P&W Gages and Gaging Equipment. To obtain a copy of Catalog, or of any individual Bulletin(s) illustrated, simply check the corresponding numbers in this coupon . . .

Pratt & Whitney

Division Niles-Bement-Pond Company

WEST HARTFORD 1, CONNECTICUT

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11 Charter Oak Boulevard
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I'd like to have, without obligation, the P&W Gage literature checked below. Please send to

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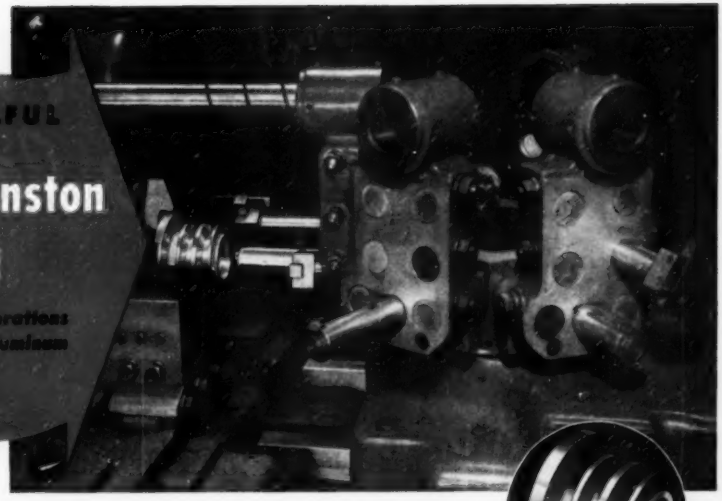
Catalog No. 11....

IT TAKES SKILFUL TOOLING

Potter & Johnston Tooling

To do 12 machining operations on a piece like this aluminum pulley casting



It takes years of experience and a special kind of engineering ingenuity to dope out the right combination of operations, turret face by turret face that results in better work and more of it per day at lowest cost per unit.

That is the particular specialty of P&J tooling engineers — proved time and again by outstanding parts production performance in the field.

That is why it is to your very great advantage to take your production problems to P&J — see what we have to suggest when you send us your parts or prints.

Tooling recommendations, estimates and time studies cost you nothing and may show the way to big savings. How about it?

HERE IS THE JOB,
ONE TURRET FACE AFTER ANOTHER

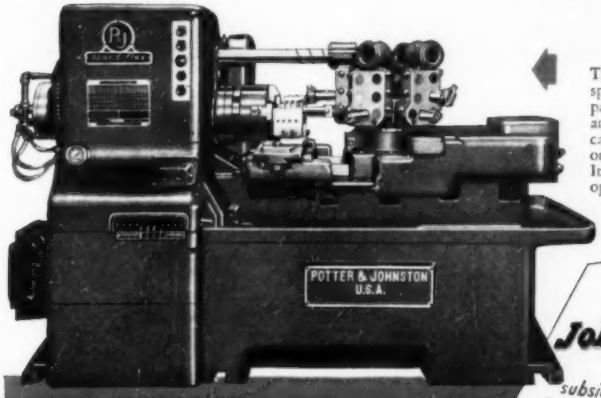
1st T.F.: Bore hole halfway; rough turn, O.D.; face end; rough and finish form "V" grooves; face flange.

2nd T.F.: Bore balance of hole; bore C'bore at front end; finish turn O.D.; face end.

3rd T.F.: Finish bore hole and C'bore.

4th T.F.: Machine grooves in bore (slide tool)

5th T.F.: Size bore hole 2.047" dia.



HERE IS THE MACHINE

THE P&J 3U SPEED-FLEX

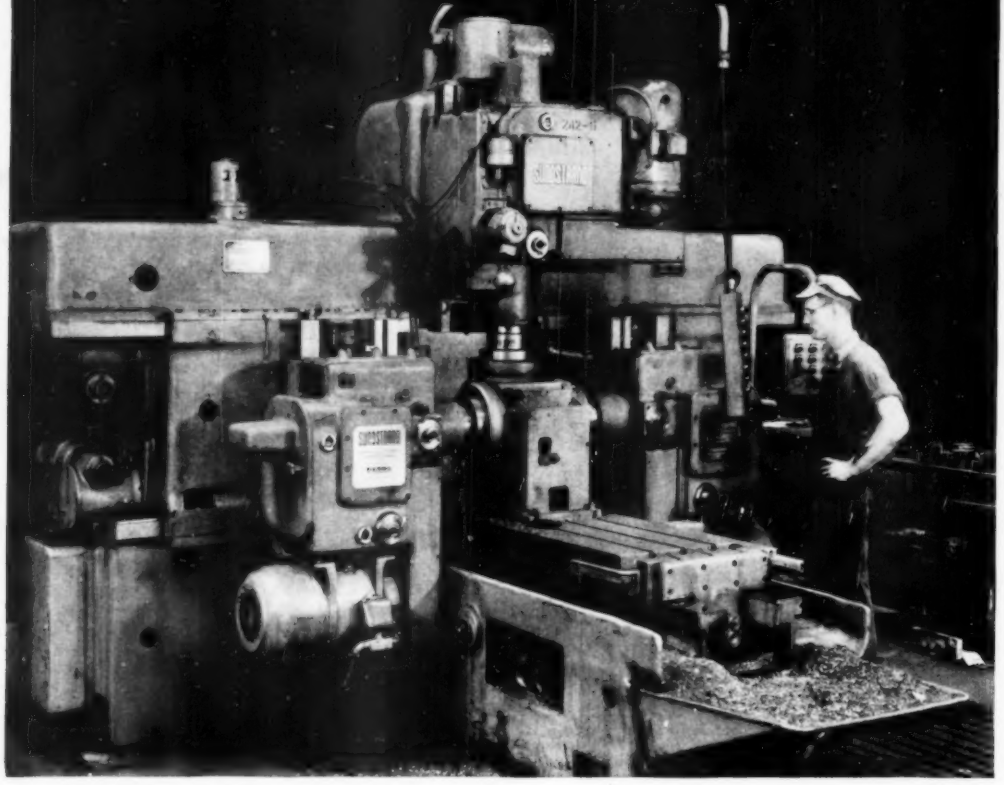
This Potter & Johnston Automatic Turret Lathe is specially designed for high speed production of small parts. It is equipped with four automatic speed changes and three automatic feed changes, electro-pneumatically controlled. It effects split second change of speeds or feeds or shift from the feed to the rapid traverse. It provides independent or simultaneous cross-slide operation with selected turret faces or with all six.

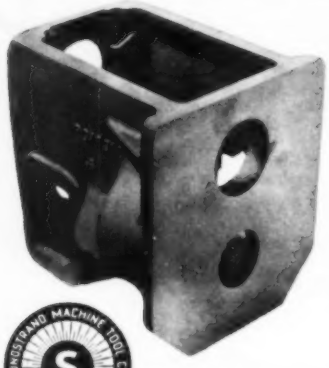
3U SPEED-FLEX

Potter & Johnston Company
Pawtucket, R. I.
subsidiary of Pratt & Whitney
Division Niles-Bement-Pond Company

P&J

Save Time—Get Better Accuracy On *More Milling Jobs . . .*





By Milling 3 Sides Of Wide Or Narrow Parts At One Time . . .

The Sundstrand Triplex Milling Machine has the flexibility to accommodate both wide and narrow parts without sacrificing accuracy. Three spindle heads, one vertical, two horizontal, can be adjusted to mill three sides of a part simultaneously. The vertical spindle is offset from the horizontal spindles, making it possible to mill three sides with absolutely square corners using conventional instead of expensive interlocking cutters. Individually motor driven heads permit the use of one, two or all three heads while milling. Extra rigidity and built-in accuracy makes it possible to take split or overlapping cuts and maintain extreme accuracy and flatness.

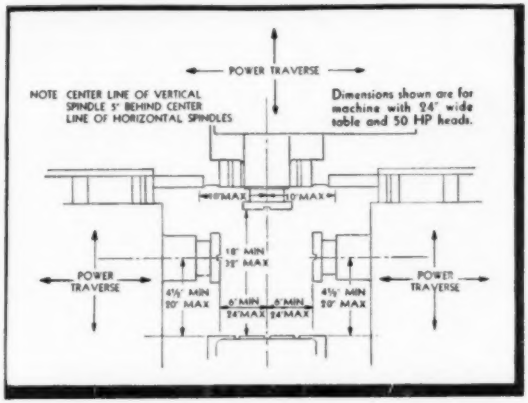
All these design features make it possible to quickly and easily adjust this machine for handling both wide and narrow parts. Because all three heads and the adjustable columns are on ways, there is no sacrifice in accuracy or production due to the wide range of adjustment.

SUNDSTRAND MACHINE TOOL CO. ROCKFORD, ILLINOIS, U.S.A.

RIGIDMILS • FLUID SCREW RIGIDMILS • AUTOMATIC LATHES • HYDRAULIC EQUIPMENT

3 Cutters Milling Simultaneously Cut Handling And Machining Time

The Sundstrand Triplex Rigidmil illustrated is used for milling several sizes of transfer and transmission cases as well as many other milling operations. On the transmission case illustrated, the Sundstrand Triplex Rigidmil reduced the number of operations required from seven to three. On a similar part, a transfer case, the number of operations were reduced from eight to three, and the time including setup and handling from 2.59 to less than one hour. In addition, the consistent accuracy obtained in milling reduced assembly time.

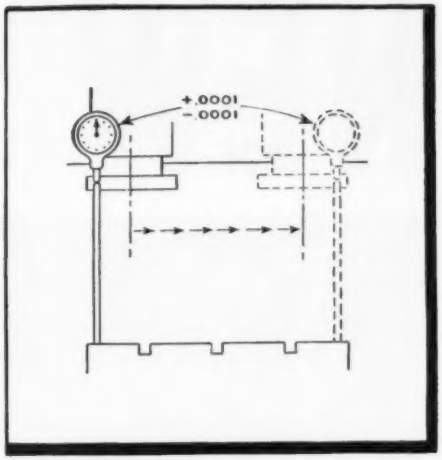


Column Adjustment Provides Rigid Support For Accurate Milling Of Both Wide And Narrow Work . . .

As shown in drawing above, both horizontal heads are carried on adjustable columns which can be spread for handling wide work and brought together for handling narrow work. Thus, a much wider range of work pieces can be machined very accurately, because cutter overhang is held to a minimum on narrow as well as wide work pieces. The vertical head is mounted on vertical ways which, in turn, are carried on a way type cross rail for positioning crosswise to the machine table. Power movement is provided for cross movement of columns, for positioning the cross rail that carries the vertical head and vertical movement to the vertical head. Power clamping and unclamping is provided for each of the above moving members.

Ample H.P. For Carbide Milling

Heads are independently motor driven, and each can be furnished in either 15, 25 or 50 HP capacities. Machines can be furnished in table widths of 24″ or 30″ and feed strokes up to 168 inches with larger or special sizes available on request. Smaller fixed column Triplex Rigidmils with 14″ or 18″ wide tables can also be furnished.



Built-In Accuracy Assures Accurate Milling

Note the drawing shown above. The accuracy indicated is possible because of the unique design of the cross rail. This heavy part is designed to rest flat on ways and, consequently, can be shifted or moved for positioning without destroying alignment. It has a power locking device for quick clamping during the cut. Micrometer adjustment insures accurate endwise positioning of all the spindles.

FREE

Additional Data

in this bulletin includes information on Sundstrand Simplex, Duplex and Triplex Rigidmils up to 75 horsepower. Write for your copy today. Ask for bulletin 184.

SUNDSTRAND MACHINE TOOL COMPANY

2533 Eleventh St. • Rockford, Ill., U.S.A.

DRILLING AND CENTERING MACHINES • SPECIAL MILLING AND TURNING MACHINES

NEW SHEAVE

Another *Texrope* Engineering Triumph

AUTOMATIC SHEAVE DOES COMPLETE JOB!

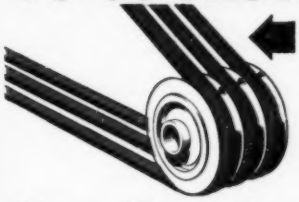
- ★ Instant speed control at lower cost than ever before
- ★ Covers most speed changing needs from 3 to 20 hp
- ★ Extremely simple — one sheave does all
- ★ No need to stop machine or take load off
- ★ Infinite variation over approximately 200% speed range
- ★ Easier starting—sheave adjusts to load.

HERE IS THE SIMPLEST, lowest cost way ever devised for changing machine speeds without stopping the machine. Simply move the motor forward to increase speed and move it back to decrease. The new *Vari-Pitch* Automatic Sheave adjusts to the new belt position *automatically*. Other parts of drive are standard *Texrope* drive components.

ALLIS-
Originators of the

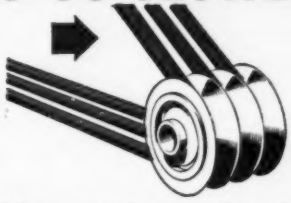
Changes Speed Without Stopping

TO GO FASTER



Move Motor Forward

TO GO SLOWER



Move Motor Back

------ONE HAND DOES IT... *While Motor is Running*

This new method of speed control will lower drive costs in nearly every industry where variable speed drives are used. It will make possible savings in many industries where variable speed is not now used because of high initial cost.

Find out now how this new idea in speed control can save money for *you*.

For details see your A-C Authorized Dealer or Sales Office or write for Bulletin 20B7223. *Texrope* and *Vari-Pitch* are Allis-Chalmers trademarks. A-2708

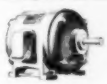
ALLIS-CHALMERS, 999A SO. 70 ST.
MILWAUKEE, WIS.

CHALMERS

Multiple V-Belt Drive for Industry

Sold . . .
Applied . . .
Serviced . . .

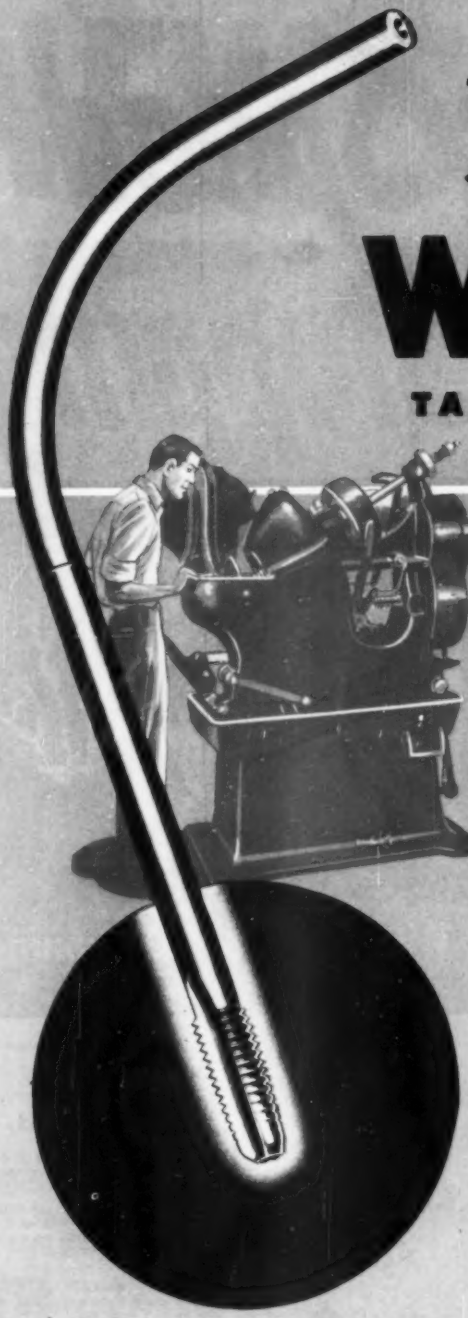
by Allis-Chalmers Authorized Dealers, Certified Service Shops and Sales Offices throughout the country.



MOTORS — ½ to 25,000 hp and up. All types.

CONTROL — Manual, magnetic and combination starters; push button stations and components for complete control systems.

PUMPS — Integral motor and coupled types. Sizes and ratings to 2500 GPM.



WINTER

TAPS IN ACTION

WINTER BENT SHANK TAPPER TAPS are recommended for high production threading of nuts in automatic tapping machines. They are designed with a long chamfer that makes entering the work easier, and spreads the cutting action over many teeth. For automatic ejection, the bent shank is made slightly smaller than the root of the thread, so that the finished nuts move freely over it. Winter also offers straight shank tapper taps, and a full line of other taps and dies, including hand, chip driver, machine screw, nut, pipe, pulley, and stove bolt taps.

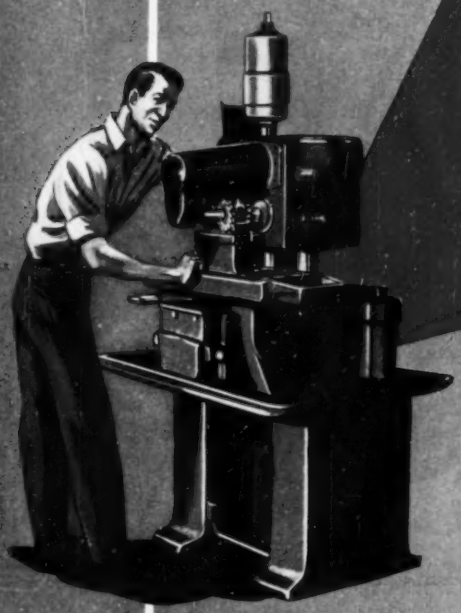
ALWAYS AT YOUR SERVICE

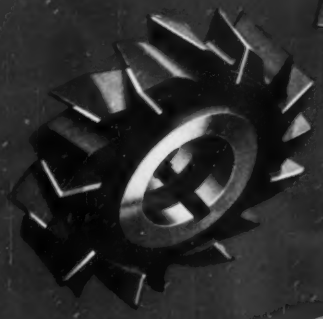
YOUR LOCAL DISTRIBUTOR carries a complete stock of Winter taps on his shelves—as close to your tapping problems as the telephone on your desk.

WINTER BROTHERS COMPANY • Division of the National Twist Drill and Tool Company

Rochester, Michigan, U. S. A. Distributors in Principal Cities • Branches in New York, Detroit, Chicago, San Francisco

NATIONAL METAL CUTTING TOOLS ON THE JOB





NATIONAL SIDE MILLING CUTTERS are recommended for straddle milling and slotting, as well as side milling. Their design provides ample space for chip removal, without loss of structural strength. For heavy duty side milling, **NATIONAL HALF SIDE MILLING CUTTERS** are recommended. They have deep spiral gashes that give the teeth a positive side rake, assuring smooth cutting action and long tool life. National makes a complete line of milling cutters, as well as other rotary metal cutting tools, including twist drills, reamers, counterbores, end mills, hobs and special tools.

CALL YOUR DISTRIBUTOR

LEADING DISTRIBUTORS EVERYWHERE offer complete stocks of NATIONAL cutting tools. Call them for cutting tools or any other staple industrial product.

NATIONAL TWIST DRILL & TOOL ROCHESTER, MICH., U.S.A.

National

NATIONAL TWIST DRILL AND TOOL COMPANY • Rochester, Michigan, U.S.A.

Distributors in Principal Cities • Factory Branches: New York • Chicago • Detroit • Cleveland • San Francisco

Sharpen **HOBS, CUTTERS or REAMERS**

ON THE

BARBER-COLMAN *HRS*

PROVIDE POSITIVE MECHANICAL CONTROL OVER...

- **LEAD**
- **FLUTE SPACING**
- **DIAMETER SIZE**
- **PERIPHERAL PROFILE**
- **RAKE ANGLES**
- **CUTTING CLEARANCES**

This machine is designed to take the guesswork out of cutting tool sharpening. It eliminates dependence on hand methods with their possibilities for inaccuracies and wasted tool life. It provides, in one machine, the techniques for sharpening faces, periphery and relief clearances on almost all types of fluted rotary cutting tools.

The combination is a very flexible machine. It furnishes complete mechanical control over precision sharpening. Send for full particulars in new Bulletin No. 2123.

Barber-Colman Company

GENERAL OFFICES AND PLANT, 2123 LOOMIS ST., ROCKFORD, ILLINOIS, U. S. A.

BARBER COLMAN

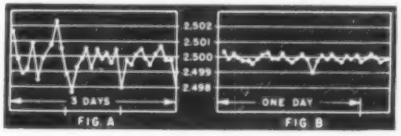
What's in
VERMONT
this month?

HOW OPERATION CONTROL SAVES MONEY ON PRODUCTION THREADING

It took but three weeks to locate and correct the cause of production faults shown in figure A. Installation of Bryant thread and squareness-of-face Gages resulted in acceptability of all parts and production was increased as shown in figure B.

These unique gages give a visual quantitative reading of accuracy within tolerances or accumulated inaccuracies of lead, pitch diameter and thread form, or the presence of burrs. The squareness-of-face attachment shows relationship of face to pitch diameter.

Operation Control (1) catches mistakes as they are made; (2) places responsibility fairly on operator, tools or machine; (3) provides a statistical record of regularly sampled parts showing the status and trend of the operation at all times.



Bryant Thread Gages used in the analysis shown above proved that a sizable investment in new machines was unnecessary, and, most important, improved the accuracy and production of these internally threaded parts.

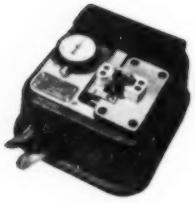
Some of the Bryant Gages are illustrated on the following page.

Bryant Chucking Grinder Co. • Springfield, Vermont, U.S.A.

BRYANT *Thread Gages*

3-Flute Tap Gage

Bryant thread gages, a few of which are shown, are built in many standard and special models to handle the inspection on a wide range of threaded parts. Segments for both external and internal gages are furnished to either GO or NOT GO thread form to "W" tolerances, thus accommodating all classes of fits. Capacities of standard bench models are $\frac{3}{8}$" to 5" internal and $\frac{3}{16}$" to 5" external; portable models are $\frac{7}{16}$" to 3" internal. Write the factory for full information.



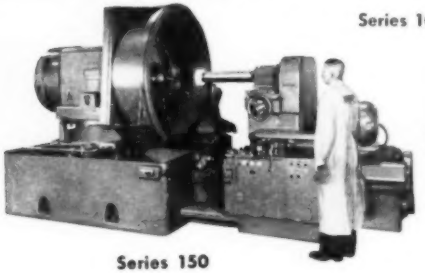
No. 1 External Thread Gage

Internal Portable Thread Gage

No. 1 Thread Gage with Squareness-of-Face Gage Attached

No. 2 External Adjustable Thread Gage

BRYANT INTERNAL GRINDERS



Series 150

Series 109

For 38 years Bryant has manufactured precision internal grinders. Today, the complete line covers machines for grinding holes from .040" to 50" in diameter. Standard and special machines will grind straight, tapered, curved and irregular holes, or any of these in combination. Face and hole grinding can be combined to assure squareness. Cams and irregular holes can be ground by using the Bryant cam tooling. Write to the factory for full details.

Bryant Chucking Grinder Co. • Springfield, Vermont, U.S.A.

contact your local distributor

This name is listed in Union's THOMAS' REGISTER insert under the heading "Drills, Twist".

UNION TWIST DRILL COMPANY, ATHOL, MASSACHUSETTS

MILLING CUTTERS • GEAR CUTTERS • TWIST DRILLS • HOBS • REAMERS • CARBIDE TOOLS

We own and operate S. W. CARD MANUFACTURING CO. Division, Mansfield, Mass., Taps, Dies, Screw Plates.

BUTTERFIELD DIVISION, Derby Line, Vt., Taps, Dies, Screw Plates, Reamers.

BUTTERFIELD DIVISION, Rock Island, Que., Milling Cutters, Twist Drills, Hobs, Reamers, Taps, Dies, Screw Plates.

for trouble-free surface grinding under extra dusty or severe operating conditions . . .

The New 2L and 2LB Surface Grinding Machines with Built-in Protection

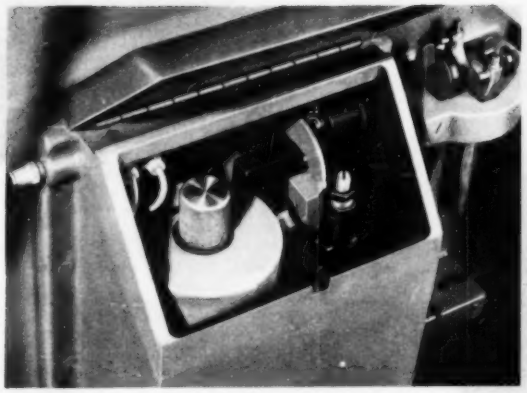
Here are two new Brown & Sharpe Surface Grinding Machines with two important, built-in features for positive protection against dust, grit and severe service conditions. In addition these machines have all the highly-productive features of the popular Nos. 2 and 2B machines.

The new machines Nos. 2L and 2LB have full automatic lubrication and strategically-placed dust guards. These features reduce maintenance costs and extend machine life . . . valuable production and investment-protection advantages.

Like the Nos. 2 and 2B, these machines are made for efficient surface grinding with precision and fine finish on small and medium-size work.

CAPACITY: Grinds work to 18" long, 6" wide and 9½" high, using a wheel 7" in diameter. No. 2L (illustrated) has automatic feeds; No. 2LB, hand feeds only.

BROWN &



AUTOMATIC LUBRICATION. Pump and filter are located in compartment on left side of machine.

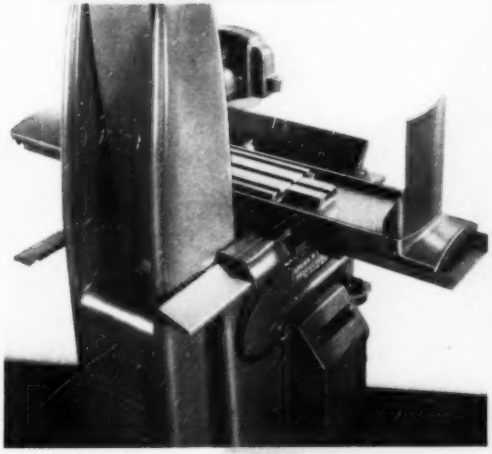
AUTOMATIC LUBRICATION !

Lubrication of the 2L and 2LB is never a chore or a worry. All moving parts and adjustable surfaces automatically lubricated by plunger pump from reservoir on left side of base. Convenient sight indicator on right side of upright shows operation of oiling system. Oil is filtered before being returned to reservoir.

DUST PROOFED !

Extra precaution has been taken to protect these machines from dust and dirt. Table ways are completely guarded. Saddle and upright ways are similarly protected. Elevating mechanism completely enclosed.

WRITE FOR DESCRIPTIVE BULLETIN . . . illustrating both the 2L (with power feeds) and the 2LB (with hand feeds only). Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.



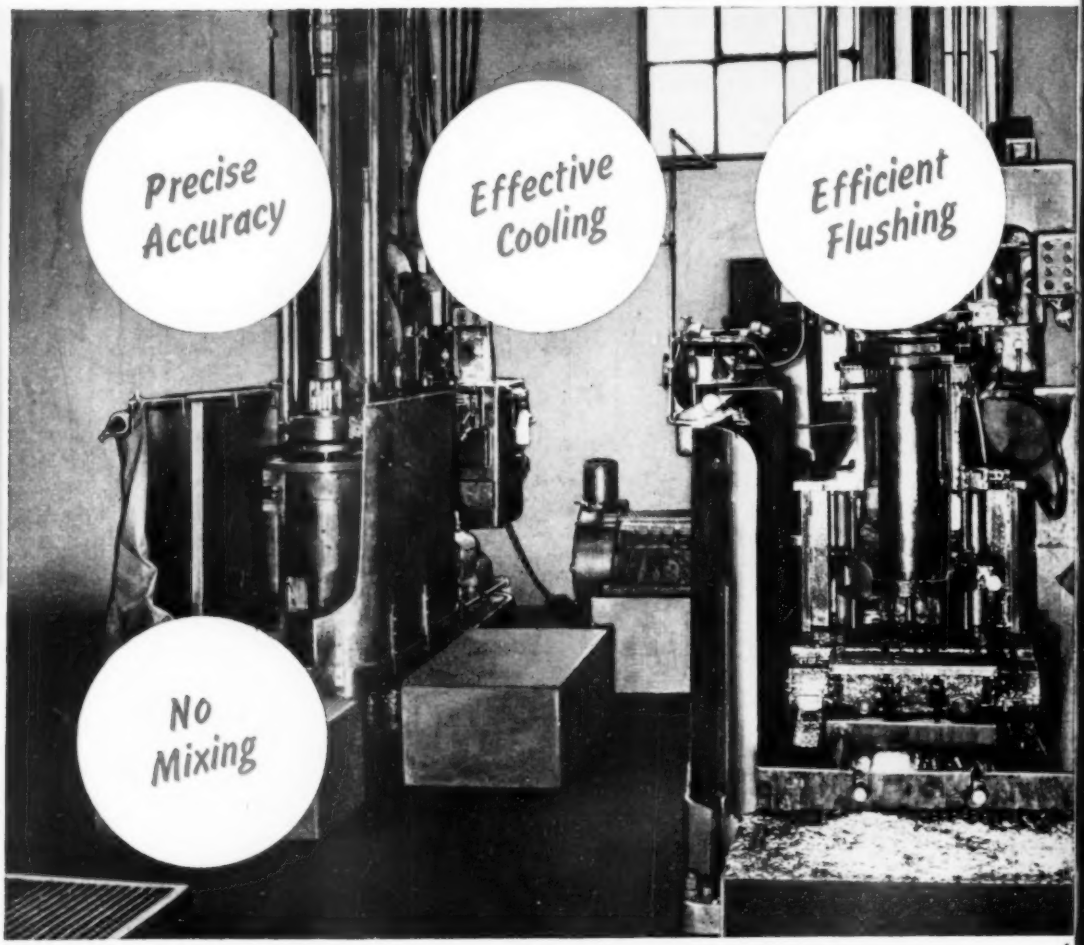
DUST PROOF COVER GUARDS. Table and saddle ways are fully protected against abrasive dust.

. . . TYPICAL PROVEN FEATURES INCLUDE

- Removable unit-type precision wheel spindle; plain or antifriction bearing type; interchangeable.
- Alternate choice of spindle drive; with motor in base; with motorized spindle.
- All controls and adjustments conveniently located. Electrical controls enclosed in separate housing.
- Versatile. Several money-saving attachments.

SHARPE B·S

SINCLAIR HONOL To Produce



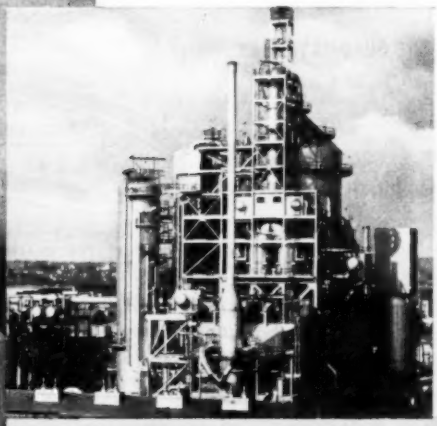
SINCLAIR

YOUR NEAREST SUPPLIER OF SINCLAIR PRODUCTS WILL GLADLY ARRANGE

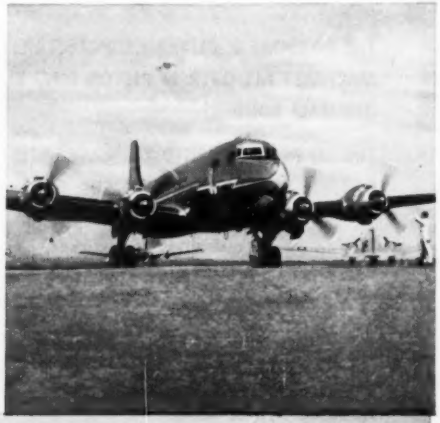
Cools and Flushes Precision Finish

Coolant properties and flushing action are important characteristics in a good honing fluid . . . for generated heat must be carried away steadily to prevent distortion and provide precision and accuracy in the final dimensions. In addition, fine abrasive particles from the honing stones must be flushed away so that the finish will be clean and unmarred.

Sinclair HONOL meets all the rigid working requirements of both the operation and the metal. This fluid comes in suitable grades ready for use. For precise accuracy and for fineness of finish, use HONOL.



New Fluid Catalytic Cracking Stills (like the one shown here) are helping to expand Sinclair's refinery output. Sinclair's great refineries are now turning out products at the rate of 150,000,000 gallons of lubricating oil yearly.



About 40% of all the Aircraft Engine Oil used by domestic Airlines in the U.S.A. is supplied by SINCLAIR. The same careful research that developed this high quality oil for the Airlines is put into HONOL and other Sinclair Oils.

INDUSTRIAL OILS

FOR LUBRICATION COUNSEL, OR YOU MAY WRITE TO SINCLAIR REFINING COMPANY, 630 FIFTH AVE., NEW YORK 20, N. Y.

17 Completely Turned Piston Rings in 1½ Minutes!

THE BARDONS & OLIVER HYDRALECTRIC LATHE AUTOMATICALLY MACHINES ALL OVER 17 PISTON RING BLANKS IN ONE AND ONE-HALF MINUTES.

THE RINGS ARE TURNED TO TOLERANCES OF ± .001 INCH ON THE OUTSIDE AND INSIDE DIAMETERS, AND ± .0005 INCH ON THE WIDTH.

The 14" long cast alloy iron tubes, or pots, are hopper-fed through the hollow spindle to the collet chuck.

The turning and boring tools are carried by a longitudinal slide and the multiple cutting-off blades by a cross slide in the rear. Both are operated hydraulically.

For quick and easy set-up, all the functions of the machine can be controlled manually. By pressing an electric button, the machine is changed to full automatic performance.

This *hydralectric automatic machine* can be modified to handle a large variety of work at a very high rate of production. It can be "tailored" to the job for high quality work at lowest cost.

We suggest you send us blue prints and samples and let our engineers study your production problems.

We build a complete line of Cut-Off Machines, and also a comprehensive line of ram and saddle type Turret Lathes

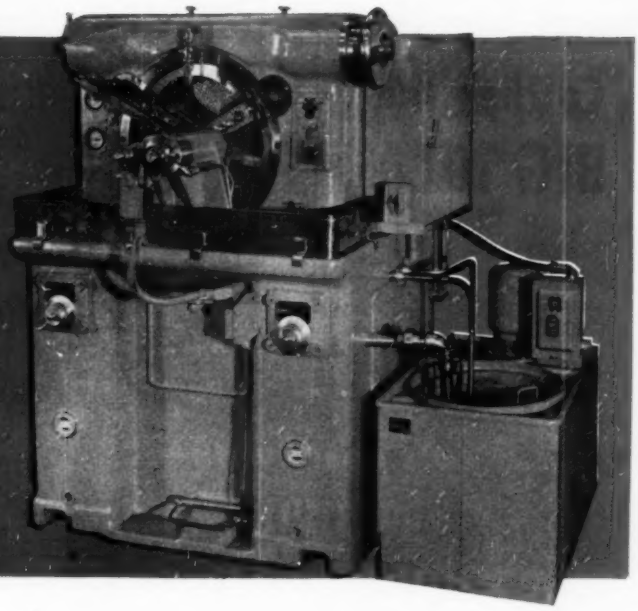
BARDONS & OLIVER, INC.

1133 WEST 9TH STREET • CLEVELAND 13, OHIO

WANT CLOSE-FIT THREADS...*FAST?*

then you want

THE NAMCO TRIPLE ROLL HYDRAULIC THREAD and FORM ROLLING MACHINE with Magazine Feed and Hydraulic Loader



This new precision high-production machine is the perfect answer for shops that have a large volume of long and short thread work requiring up to class 4 fit and unsurpassed finish.

Operating on the feed-through principle, with interchangeable two-roll or three-roll heads, the Namco Thread-Roller regularly produces smoother, more accurate work than ground threads. Capacities range from $\frac{3}{8}''$ up to $1\frac{1}{2}''$ using three rolls—and $\frac{1}{8}''$ to $\frac{9}{16}''$ using two rolls. Because of three-roll operation and three-point support which eliminates distortion, the machine is a "natural" for hollow work.

With the addition of magazine feed and hydraulic loader, just announced, the Namco Thread Roller becomes the fastest, most versatile, *most accurate* means for threading and form rolling, solid or hollow work to close tolerances with fine finish. Send us samples of the jobs you do; we'll do the rest—in quoting you on your requirements.

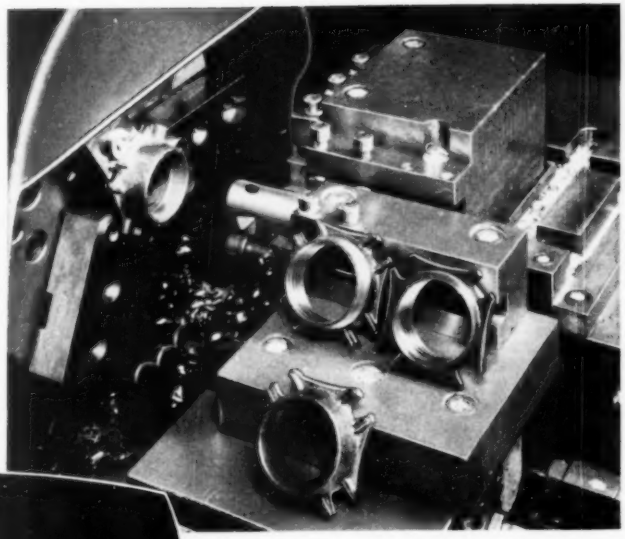
Complete details on the Namco Thread Roller are contained in this new eight-page bulletin. Ask us for TR 47.

The NATIONAL ACME CO.

170 EAST 131st STREET • CLEVELAND 8, OHIO

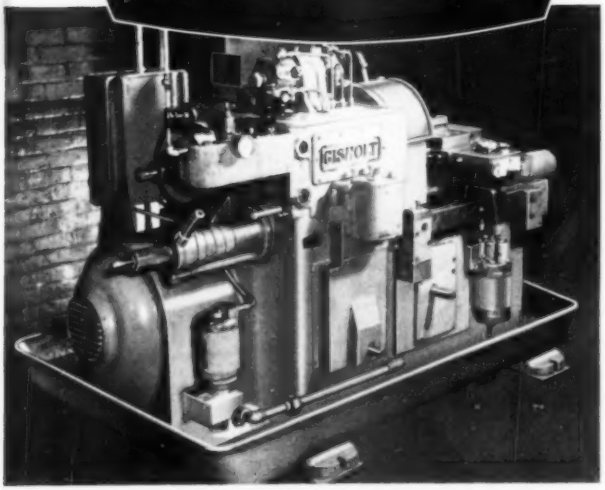
Acme-Gridley Bar and Chucking Automatics: 1-4-6 and 8 Spindle • Hydraulic Thread Rolling Machines • Automatic Threading Dies and Taps • The Chronolog • Limit, Motor Starter and Control Station Switches • Solenoids Centrifuges • Contract Manufacturing

Small Job Shop Catches the BIG IDEA



cuts costs with—

GISHOLT No. 12 HYDRAULIC AUTOMATIC LATHE



No matter whether the shop is large or small . . . if there's volume, there's the opportunity to make money faster with automatic machining.

The Kilbourn Engineering Company of Milwaukee saw it—and proved it again—subcontracting these parts for electric hot water heaters with the Gisholt No. 12 Hydraulic.

Greater Production

With its fast automatic cycle and multiple cutting, the Gisholt turns out these parts at twice the rate of the previous method. A man merely loads and unloads the machine. The owner is not limited to this one job either. It is easily set up to handle a variety of work up to 12" in diameter.

Corner for Profit

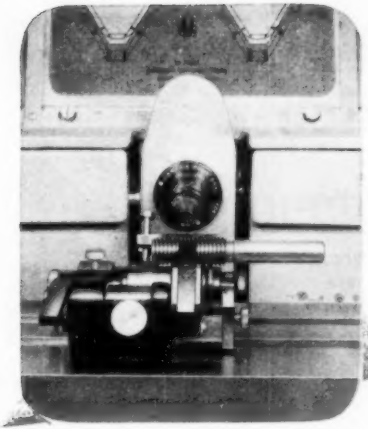
Such work can be highly profitable for job shops. Especially when the whole operation can be tucked into one small corner of the shop as this one is.

Progressive thinking like this is what makes many small shops grow into big ones. Gisholt engineers can help you with all kinds of ideas for making the most of machine tools.

GISHOLT MACHINE COMPANY
Madison 10, Wisconsin

THE GISHOLT ROUND TABLE
represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES



With This Fixture

YOU CAN LEARN MORE ABOUT ALL THE ELEMENTS OF A PRODUCTION THREAD—AND QUICKER—THAN BY ANY OTHER KNOWN GAGING METHOD

The new Universal Screw Stage for Jones & Lamson Optical Comparators provides the only method which simultaneously compares all the elements of a thread with a master gage. It checks at a glance, lead (for the whole length of screw engagement), pitch diameter and thread angle; crest, root and taper. The enlarged shadow instantly reveals wear of tool, chasers, rolling dies, or grinding wheel. It not only detects individual errors, but shows their cumulative effect. It is the only universal stage that will measure a wide range of diameters and pitches, as well as right or left hand threads.

Write Dept. 710
for descriptive folder giving complete details. This Stage can be used on any Jones & Lamson Comparator.

Optical Comparator Division

JONES & LAMSON MACHINE COMPANY
Springfield, Vermont, U.S.A.

MACHINE TOOL CRAFTSMEN SINCE 1835

How "Triple C" Plan Helps Federal-Mogul Corporation Maintain Leadership

J. L. Wood, Plant Manager of the Detroit Branch, Federal-Mogul Corporation, manufacturers of bearings noted for exceptional precision and quality, says: "A Coordinated Carbide Control program is important to the maintenance of an advantageous position in a highly competitive field."

A PIONEER in various forms of efficiency in quality production, Federal-Mogul is one of many large companies who are using Carboloy's "Triple C" plan of coordinated carbide control to help beat the trend towards high break-even points caused by rising costs.

Essentially, the plan is one of coordination of *all phases* of carbide use within a plant, under the direct supervision of a *carbide supervisor.*

Under the "Triple C" plan, design, application, and maintenance of carbide tools are standardized wherever possible; grinding, purchasing, inventory control, and handling are coordinated by a carbide coordinator.

Under "Triple C", Federal-Mogul has developed 3500 form tools. Of these 80% are ground from six inexpensive standard Carboloy single-point tools and one standard blank! The seven standards are shown below; above are a few of the form tools developed from them.

Here are a few of the benefits reported by Federal-Mogul:

Advantages of central responsibility:

- Greater utilization of carbide tools
- Organized training of personnel in carbide methods
- Immediate, expert assistance with carbide problems
- Constant inspection of carbide tools by carbide specialists
- Recognition of causes of poor performance or carbide breakage

Advantages of central stock:

- Drastically reduced carbide tool inventory
- Extensive standardization of carbide tools
- More efficient salvage and re-use of worn or broken tools
- Greater economies in special tools

Advantages of central grinding:

- Less grinding equipment needed
- Lower inventory of expensive grinding wheels
- Expert, specialized grinding of *all* carbide tools
- Longer carbide tool life
- Elimination of grinding by machine operators
- Less idle machine time

These benefits are *typical.* Wherever the plan has been adopted, similar savings in time and costs have been achieved . . . plus, of course, the amazing increases in production that extensive use of carbides brings to any manufacturing operation! The odds are ten to one that the plan can do as much for your company.

CARBOLOY COMPANY, INC.
11149 E. 8 Mile Avenue, Detroit 32, Michigan

CARBOLOY®
CEMENTED CARBIDE

COORDINATED CARBIDE CONTROL
THE CARBOLOY "TRIPLE C" PLAN
FOR EVEN GREATER SAVINGS WITH CARBIDES

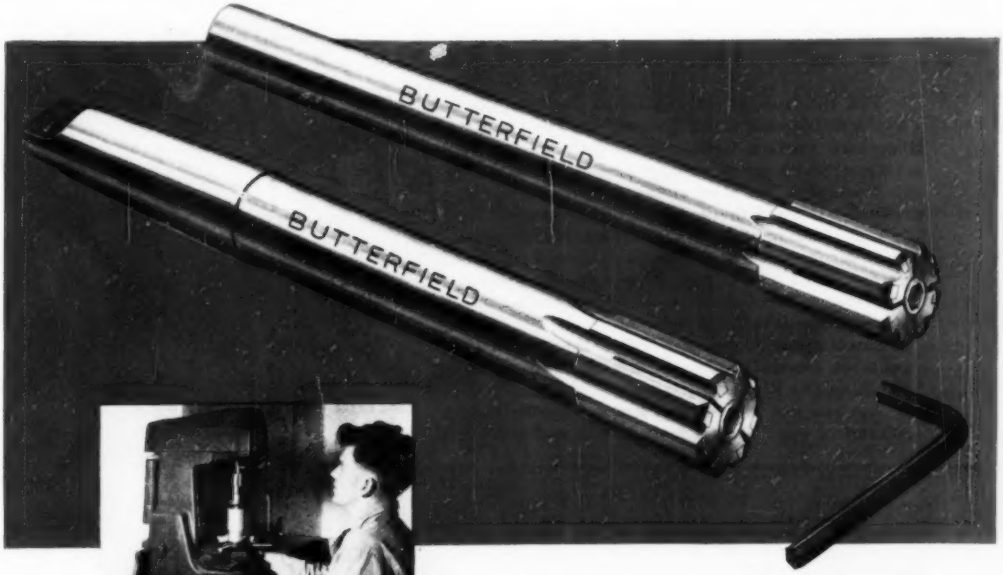
Now... Butterfield's

100% Inspected Tools Include the NEW FLEX-RITE REAMER!

Your production-reaming problems will be greatly simplified with Butterfield's new Flex-Rite reamer. Greater accuracy... lower costs... and higher production rates are made possible by Flex-Rite because the blade-expansion feature permits repeated sharpenings while maintaining original size 100%.

And remember, like all Butterfield tools, Flex-Rite reamers are 100% inspected... *because only 100% inspection makes quality certain.*

See this latest addition to the Butterfield line at your nearby distributor. Union Twist Drill Company, BUTTERFIELD DIVISION, Derby Line, Vermont and Rock Island, Quebec.



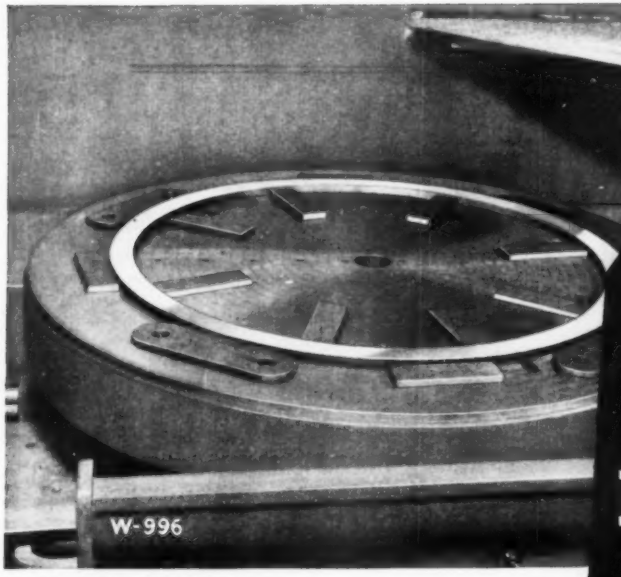
Testing hardness of finished tools on a Rockwell Hardness Testing Machine.

BUTTERFIELD

THE 100% INSPECTED TOOLS

Every Tool Individually Inspected

TAPS • DIES • REAMERS • SCREW PLATES



A SAVING OF $8.00 PER PIECE

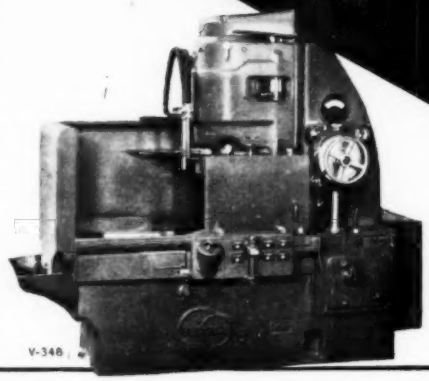
WHEN THEY.... PUT IT ON THE BLANCHARD

Yes, this special alloy stainless steel ring 28" x 2½" x 9/16" was finish ground on the No. 18 Blanchard Surface Grinder with 36" chuck at a saving of $8.00 per piece over previous method.

Machining this alloy stainless steel ring by the previous difficult method cost $9.00 per piece. The combination of Blanchard Grinder, Blanchard Engineering, and wheel selection reduced production cost to $1.00 per ring. One side was ground removing .070" of metal to close dimension and flatness tolerances.

Here again is proof positive that the most profitable words in flat surface machining are "Put it on the Blanchard."

Are you machining your flat surface the most economical way? Talk it over with Blanchard.



Send for your free copy of "Work Done on the Blanchard", third edition. This new book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.

Send for your free copy of the first edition of "Art of Blanchard Surface Grinding." This newest of Blanchard books shows you how to get best production results with Blanchard Surface Grinders.

BLANCHARD

The **BLANCHARD** MACHINE COMPANY

64 STATE STREET, CAMBRIDGE 39, MASS., U. S. A.

	Machinability	Hobability	Core Strength	Wear Resistance	Distortion in Hardening	Pressure and Temperature
DURAMOLD C water-hardening, hobbing	POOR	BEST	POOR	GOOD	FAIR	LOW to MEDIUM
DURAMOLD B oil-hardening, hobbing	POOR	BEST	FAIR	GOOD	GOOD	LOW to MEDIUM
DURAMOLD A air-hardening, hobbing	*POOR	†GOOD	GOOD	GOOD	BEST	MEDIUM to HIGH
MULTIMOLD for machined molds, heat-treated or carburized	BEST	FAIR	FAIR	**FAIR	FAIR	MEDIUM
BTR oil-hardening, for machined molds	GOOD	FAIR	GOOD	GOOD	GOOD	HIGH
A-H5 air-hardening, for machined molds	FAIR	POOR	BEST	GOOD	BEST	HIGH

* Best, when annealed for machining
† Fair, when annealed for machining
** Good, when carburized and hardened

START WITH THE RIGHT MOLD STEEL

In selecting tool steel for plastic molds the first step is to answer these questions:

1. Is the mold to be cold-hobbed or machined?
2. Is high wear-resistance important? Short or long runs?
3. What core-strength is required?
4. How much distortion in heat-treatment is permissible?
5. High or low operating temperatures? How much pressure?

As a further aid in making the best choice, refer to the chart above. This is a general guide to six of our popular mold steels. Each is scrupulously inspected to assure the sound, clean surface and properly-annealed structure necessary for highly-polished cavities.

A Bethlehem metallurgist is ready to assist you with the selection of tool steel . . . or to recommend its proper heat-treatment. Plan now to get full details on Bethlehem Tool Steels. There's a Bethlehem sales office or tool-steel distributor near you. Or write us at Bethlehem, Pa.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation
Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM TOOL STEEL

A *TEN* STRIKE

The Norton CERAMIC Surface Plate

NORTON COMPANY
Worcester 6, Massachusetts

1. **Extremely long life** is assured for these wear-resistant plates which are made of one of the hardest substances known.
2. **Flat within .0001"** is the guarantee for these ceramic surface plates—an important quality in precision measuring.
3. **Permanent flatness** is a feature of these ceramic surface plates that will not warp or deform, give expansion troubles or deflect under load.
4. **Smooth surface** allows easy movement of instruments and work across plate without drag or vibration but with correct "pull" for accurate measuring by operator.
5. **Non-magnetic** nature of this ceramic surface plate permits work to be removed from magnetic chuck and checked without necessity of demagnetizing.
6. **Non-corrosiveness** is another feature of Norton ceramic surface plates which are impervious to any atmospheric condition and do not require protection from moisture.
7. **Ideal for blueing** is the special surface texture of these plates. A uniform film is readily transferred from the plate to the work.
8. **Faster, more accurate** readings are possible because of the precise flatness and extreme smoothness of these ceramic surface plates.
9. **Prevents wear** of expensive instrument bases, gage blocks and sine bars because of the flat, smooth surface of these ceramic surface plates.
10. **Easily cleaned** with any soap powder and water—and periodic cleaning is recommended.

Write for Free Bulletin No. 1174

NORTON®

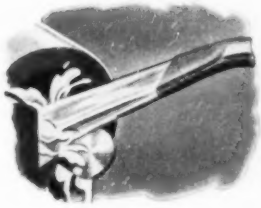
CERAMIC SURFACE PLATES

COOLANT PRACTICE FOR MACHINING ALCOA ALUMINUM

No cutting fluid can make up for poor setup or dull tools, but you'll make your Alcoa Bar Stock go farther with good coolant procedures.

You can expect a good cutting fluid to: Remove heat from work and tools. Lubricate tools and usually the tool slides. Wash away chips from tools and work. That's all.

Alcoa's technical departments are anxious to help you with cutting fluid procedures and other machining problems. Why not get acquainted by asking for a free copy of "Alcoa Aluminum in Automatic Screw Machines"? Your nearby Alcoa sales office will supply you, or write ALUMINUM COMPANY OF AMERICA, 1709 Gulf Building, Pittsburgh 19, Pennsylvania.



Use a large volume of coolant. Keep the nozzles open. Thin, high-speed streams won't cool fast enough nor keep the chips away from the tool.

Direct the stream to hit the tool and work at the proper angle. Chips should be washed away to prevent fouling the tool.

Use a good cutting fluid. Special aluminum alloy coolants generally consist of light mineral oil with 5—10% fatty additions. Viscosity should be 45 to 65 seconds at 100 degrees F on a Saybolt Universal viscosimeter. Flash point should be above 270 degrees F.

GOOD MACHINING PRACTICES SAVE METAL

ALCOA FIRST IN ALUMINUM

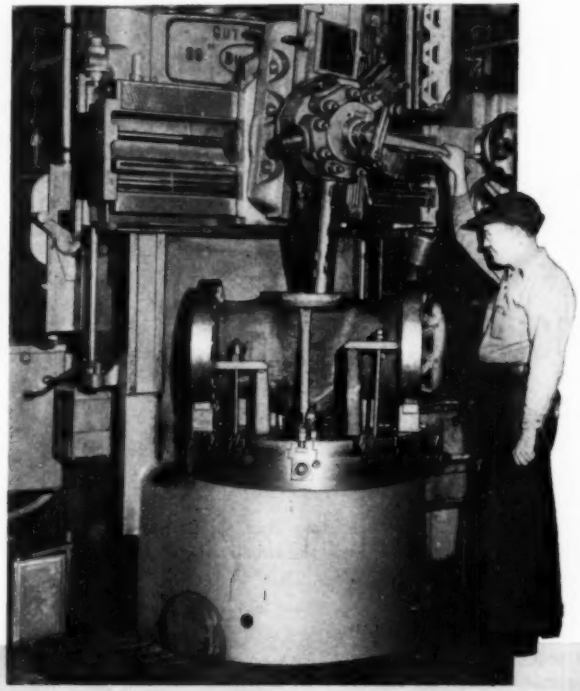
INGOT • SHEET & PLATE • SHAPES, ROLLED & EXTRUDED • WIRE • ROD • BAR • TUBING • PIPE • SAND, DIE & PERMANENT MOLD CASTINGS • FORGINGS • IMPACT EXTRUSIONS
ELECTRICAL CONDUCTORS • SCREW MACHINE PRODUCTS • FABRICATED PRODUCTS • FASTENERS • FOIL • ALUMINUM PIGMENTS • MAGNESIUM PRODUCTS

the BULLARD CUT MASTER

VERTICAL TURRET LATHE

BULLARD *Saves 2 Ways*

- 33-⅓% SAVED ON 3 OPERATIONS
- GRINDING OPERATION ELIMINATED



Bullard 36 inch Cut Master. Rigid enough to swing this large valve. Operations are taper bore, face flange and counterbore. 33-1/3 per cent time savings on three operations and because of the beautifully smooth finish, a grinding operation was eliminated.

Manufacturing Economies

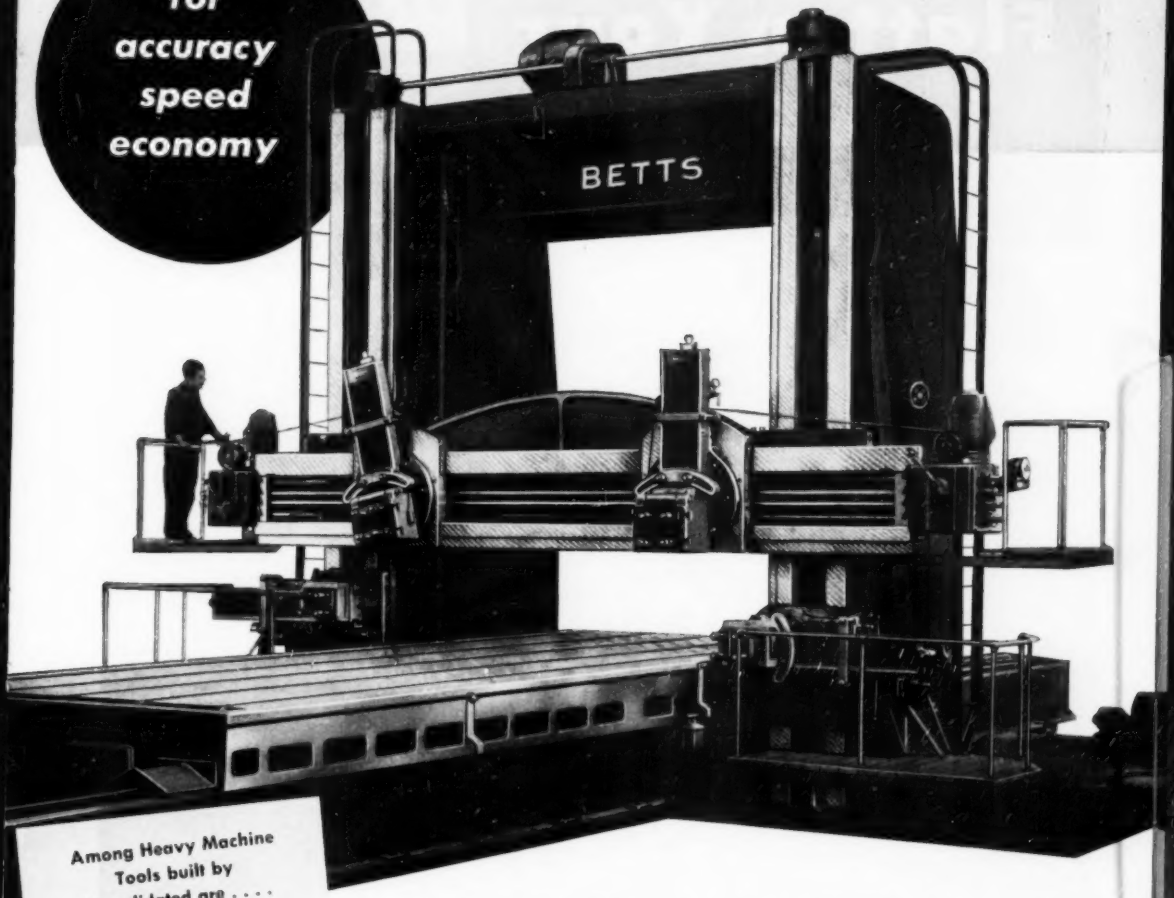
This specifically illustrates the Bullard Cut Master adaptability to problem jobs. Naturally cumulative small savings in time, due to rapid and positive speed selection, limit stops for simplified dimensional duplication, centralized operating controls and high rate of rapid traversing add up to large savings on any work.

Also the rugged construction with large Timkin spindle bearings permits heavy feeds, thereby cutting time of operations. Rigid construction and screw feeds assure a high degree of machining accuracy resulting in minimum expense for spoiled work. All in all — Use Bullards for manufacturing Economies. Write for Cut Master Catalog XY-CVTL.

The Bullard Company, Bridgeport 2, Connecticut.

BETTS HEAVY DUTY PLANERS

for accuracy speed economy



Among Heavy Machine Tools built by Consolidated are . . . .

LATHES
BORING MILLS
DRILL PRESSES
MILLING MACHINES
BORING MACHINES
COLD SAW MACHINES
BORING, DRILLING AND MILLING MACHINES
DRILL AND TOOL GRINDERS
PLANERS
SLOTTERS
RAILROAD SHOP TOOLS
AUTOMOTIVE TOOLS
AND OTHER SPECIAL MACHINES

The Betts Heavy Duty Planer shown here provides 14′-0″ between uprights, 11′-6″ under tools and 28′-0″ stroke. It is designed with three bed ways for even load distribution when machining especially heavy work. Variable voltage planer drive provides smooth, accurate operation in a wide speed range. Built in a range of sizes up to any requirement. All Betts Planers are soundly engineered to insure long, dependable service combined with operational economy, safety and convenience.

Complete information will be furnished upon request

BUILDERS OF HEAVY DUTY MACHINE TOOLS SINCE 1848

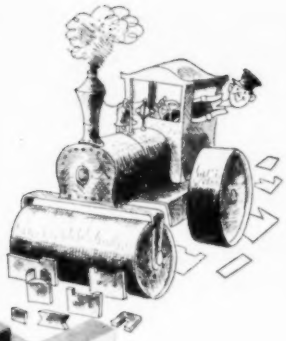
BETTS • BETTS-BRIDGEFORD • COLBURN • HILLES & JONES • MODERN • NEWTON • SELLERS

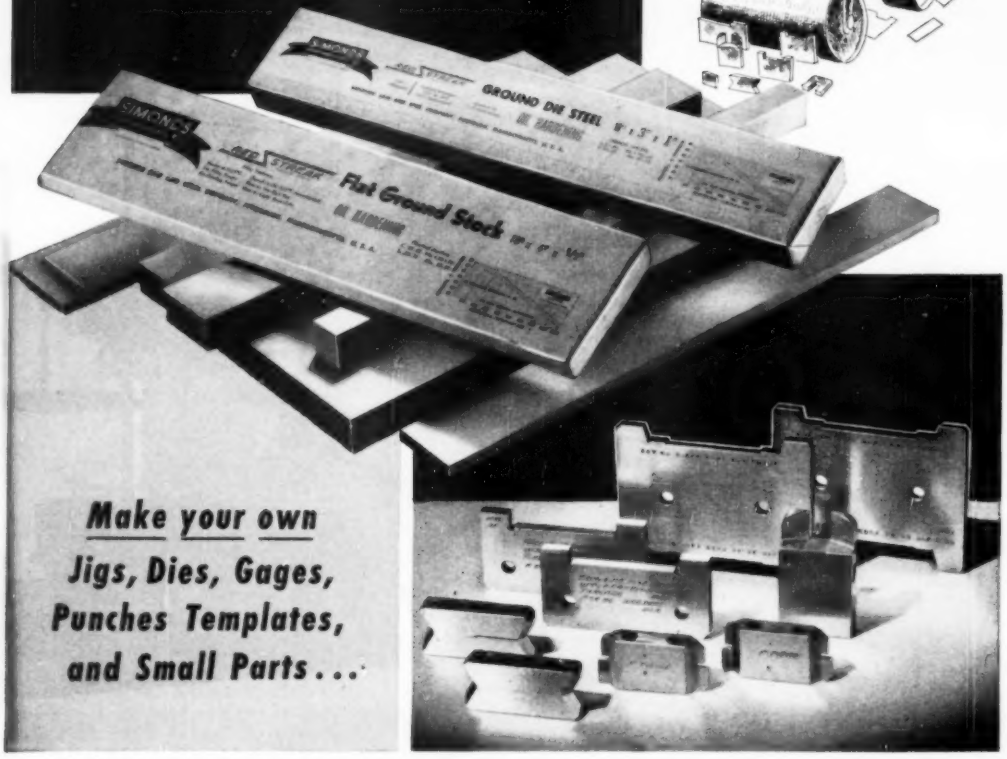
CONSOLIDATED MACHINE TOOLS

CONSOLIDATED
MACHINE TOOL CORPORATION

ROCHESTER 10, NEW YORK

Flatten Your Tool Costs!





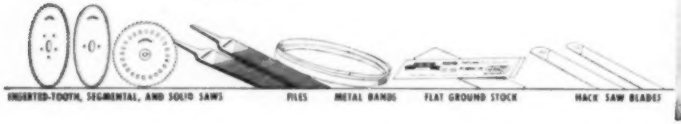
Make your own Jigs, Dies, Gages, Punches Templates, and Small Parts...

...use SIMONDS Flat Ground Stock & Ground Die Steel

100% QUALITY-CONTROLLED in Simonds own steel mill is this *oil-hardening* tool steel . . . uniformly annealed for easy cutting, machining and punching. Doesn't have to be ground to size . . . dimensions are uniformly accurate, edges finished, ends milled, surfaces micro-finished. No deformation in heat-treating . . . so you don't lose the hours and material put into punches and dies before hardening.

156 sizes are regularly carried in stock, each individually packaged, fully protected from rusting and scratching, with dimensions and heat-treating instructions clearly given. Order from your Industrial Supply Distributor.

BRANCH OFFICES: 1350 Columbia Rd., Boston 27, Mass.; 127 S. Green St., Chicago 7, Ill.; 416 W. Eighth St., Los Angeles 14, Cal.; 228 First St., San Francisco 5, Cal.; 311 S. W. First Ave., Portland 4, Ore.; 31 W. Trent Ave., Spokane 8, Wash. *Canadian Factory:* 595 St. Remi St., Montreal 30, Que.



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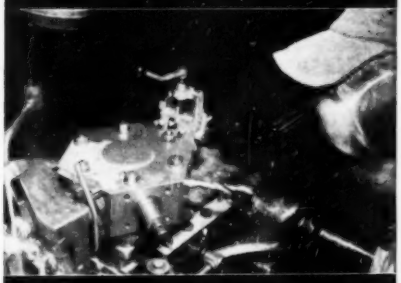
SAW AND STEEL CO.
FITCHBURG, MASS.
Other Divisions of SIMONDS SAW AND STEEL CO. making Quality Products for Industry

SIMONDS — Special Electric Furnace Steels
SIMONDS — Grinding Wheels and Grains
SIMONDS — Simonds Products for Canada

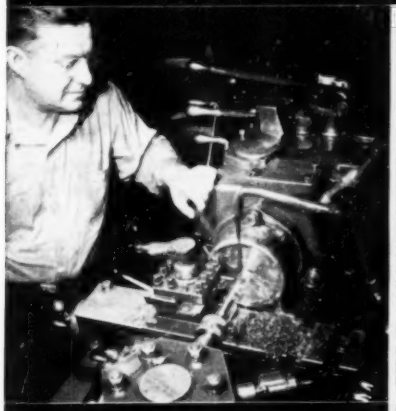
Small Lot Production..*no problem at*

AMERICAN LOCOMOTIVE

Limits of .0005" on the I.D. and .001" on the O.D. are easily held on this Starting Valve Cage of cast iron. This lot of parts has 13 pieces. The Warner & Swasey 4-A Turret Lathe shown is used for producing single repair parts also.



Diesel Engine Division of American Locomotive uses this Warner & Swasey No. 5 Universal Turret Lathe to machine Push Rod Ends in lots of 500. Closest limit held on this job: .0005".



On this Warner & Swasey No. 3 Universal Turret Lathe, a hot rolled SAE 1020 Trip Latch Pin is being machined in lots of 25 pieces. Small repair work is also done on this No. 3.

THEY know how to produce parts in short runs, profitably, at American Locomotive. They use Warner & Swasey Turret Lathes set up with Standard Tooling.

These five pictures taken at the Diesel Engine Division in Auburn, N. Y., show five different jobs being machined on five different model Warner & Swaseys. The largest lot is only 500 pieces and the smallest is just six.

In fact, Warner & Swasey Turret Lathes with Standard Tooling Setups are so flexible, American Locomotive regularly uses them for single piece jobs.

Jobs can be switched quickly with little downtime. Warner & Swasey power handles heavy multiple cuts. Warner & Swasey speed permits fullest advantages of carbide tools. Rigid Warner & Swasey design guarantees accuracy.

These turret lathes turn everything from grey iron castings to tough alloy steels and hold .0005" regularly.

That's how Warner & Swasey Turret Lathes help American Locomotive solve the small lot problem. Why not see how they can help you? Call the nearest Warner & Swasey representative or write

You can machine it Better, Faster, for Less . . . with a Warner & Swasey

WARNER & SWASEY
Machine Tools
Cleveland

Single point threading this steel Spring Plate Nut (Class 3 thread) is simple on this Warner & Swasey 3-A Turret Lathe. The part is made in lots of 6 pieces.

A steel forged drive gear for Diesel locomotives being machined on a Warner & Swasey 1-A Turret Lathe. Limit: .0005" on O.D. of hub. Pieces in lot: 20. Repair parts for locomotives are also made on this machine.

TURRET LATHES, MULTIPLE AND SINGLE SPINDLE AUTOMATICS, PRECISION TAPPING AND THREADING MACHINES

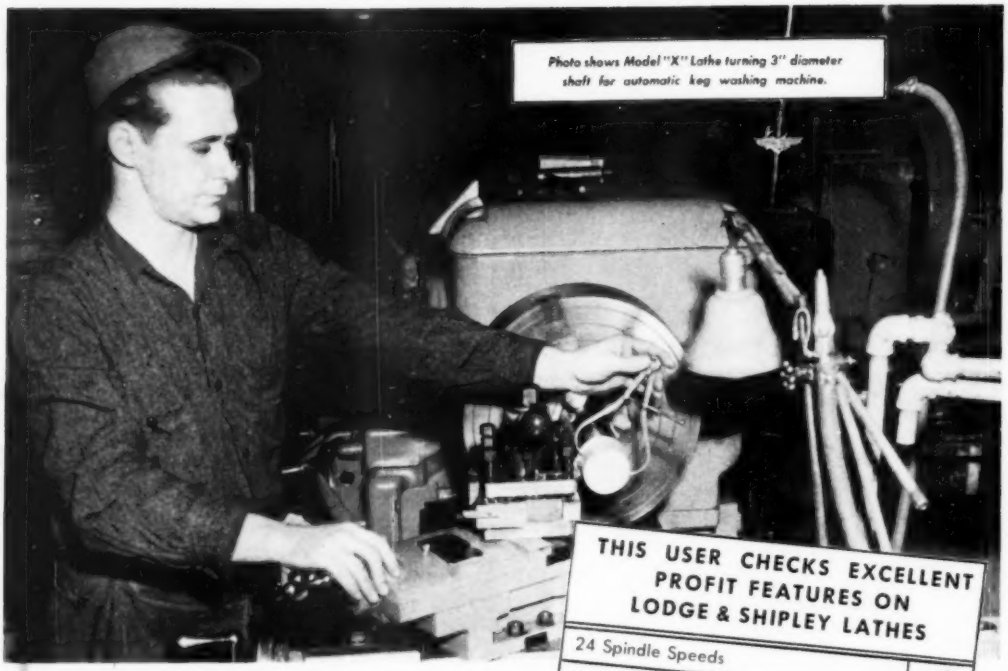


Photo shows Model "X" Lathe turning 3" diameter shaft for automatic keg washing machine.

"SPINDLE PRODUCTION INCREASED 50-60%"

...Report on Lodge & Shipley Lathe at Enzinger-Union Corporation

Manufacturers of Brewery and Chemical Equipment
Angola, New York

● Machining 3" diameter shafts for automatic keg washing machines, Enzinger-Union Corporation reports that the Lodge & Shipley Lathe is "a fine tool, capable of handling heavy as well as light work, with equal accuracy." In checking "very desirable" design features (tabulated at right) this user stated that "we are cutting a greater number of square thread spindles, 1⅞" O. D. x 10 mm. pitch, both in CRS and stainless type 303. Production of these spindles increased on this machine by 50-60%."

This data reflects the experience of many thousands of Lodge & Shipley Lathe users, who find these modern machine tools "accurate to a high degree", "excellent on versatility" and incorporating design features that make profitable operation as easy as it is important.

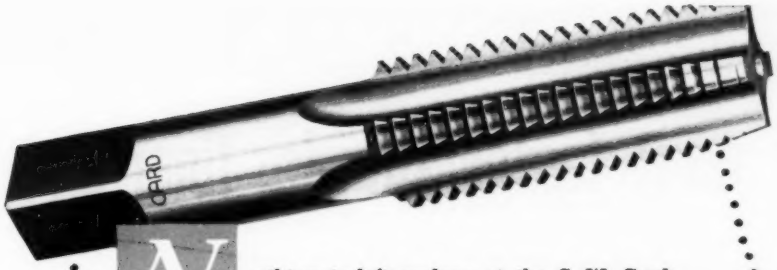
THIS USER CHECKS EXCELLENT PROFIT FEATURES ON LODGE & SHIPLEY LATHES

24 Spindle Speeds	✔
Horsepower Capacity	✔
Slide Rule Calculator	✔
3 Roller Bearing Spindle Mounting	✔
Ball Stop	✔
Hardened Cross Feed Screw Threads	✔
Compensating Cross Feed Nuts	✔
Apron Feed & Thread Interlock	✔
Complete Automatic Lubrication	✔
Hardened Steel Bedways	✔
Totally-Enclosed Quick Change Gear Box	✔
Heavier, More Rugged Design	✔

Let your Lodge & Shipley Representative show and explain newly developed, exclusive features like the "Slide Rule Calculator" which eliminates tedious figuring or guess work from speed calculations.

THE **Lodge & Shipley** COMPANY

MACHINE TOOL DIVISION • 3055 COLERAIN
SPECIAL PRODUCTS DIVISION • 800 EVANS ST.
CINCINNATI 25, OHIO



Nothing is left undone at the S. W. Card Manufacturing Company's factory at Mansfield, Massachusetts, to insure that every tap reaching your hands is 100% perfect . . . ready to give you top performance over a long service life.

But to make *doubly sure* of your continuing satisfaction we have retained the outstanding PITTSBURGH TESTING LABORATORY to buy Card Taps periodically on the open market *anywhere in the United States* . . . and subject them to rigorous tests to make *certain* that Card Taps reaching the market are right up to standard!

No wonder increasing numbers of metal-working plants whose production schedules *demand* accurate, dependable cutting tools are turning to Card.

And for fast, dependable service that saves you time and money, contact your nearby Card Distributor.

CHECKED HERE BY CARD

DOUBLE CHECKED HERE BY PITTSBURGH TESTING LABORATORY — ANALYSIS INSPECTION TESTING RESEARCH — ENGINEERS AND CHEMISTS

S. W. CARD

MANUFACTURING COMPANY
Mansfield, Massachusetts
DIVISION OF UNION TWIST DRILL CO.

The CARD Quality

TAPS
The Certified Cutting Tools*
*by the Pittsburgh Testing Laboratory
Also makers of DIES • SCREW PLATES
DIE STOCKS • TAP WRENCHES

MAKING AUTOMATIC SCREW MACHINE PARTS?

If you want faster speeds, finer finish,

See the difference in the finish!

These Champion spark plug shells tell the story. In a test run, conducted by Champion Spark Plug Company, Toledo, O., the shell at left machined from regular B-1113 stock shows normal surface finish. The shell at right was machined immediately afterwards on the same machine (an RA 6 Acme Gridley Automatic) and at the same extremely high speed. The improvement in surface finish is readily apparent. (Unretouched photos twice normal size.)

fewer tool grinds, fewer rejects

TRY NEW U·S·S FREE-MACHINING

MX* BAR STOCK

THIS *new* free-cutting steel may be just what you need to improve your product quality or to cut your costs.

Falling within the composition limits of standard B-1113 steel and with similar tensile properties, U·S·S Free-machining MX has been under development for more than five years.

In exhaustive laboratory and field tests this improved bessemer steel has clearly demonstrated its superiority on several important counts. Its definitely greater machinability and greater uniformity mean higher operating efficiency all along the line: — faster production, bigger output, fewer tool replacements, less machine down-time.

The fact that this steel does not "fight" the tool, results in longer tool life and insures a better finish and more closely maintained dimensional exactness.

Quoting from "case-history" files, here are the desirable properties that have been revealed in actual on-the-job tests: —"*Up to 20% greater machinability . . . considerably increased tool life . . . exceptional finish . . . smooth, brighter, sharper threads . . . less burr in milling . . . it cold forms readily.*"

• • •

Why not find out how U·S·S Free-machining MX works on your equipment? You can obtain cold-finished bars from your regular supplier. In hot-rolled bars, MX is available through our nearest district sales office. A qualified metallurgical representative will gladly discuss its possibilities with you.

CARNEGIE-ILLINOIS STEEL CORPORATION, PITTSBURGH AND CHICAGO
COLUMBIA STEEL COMPANY, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS
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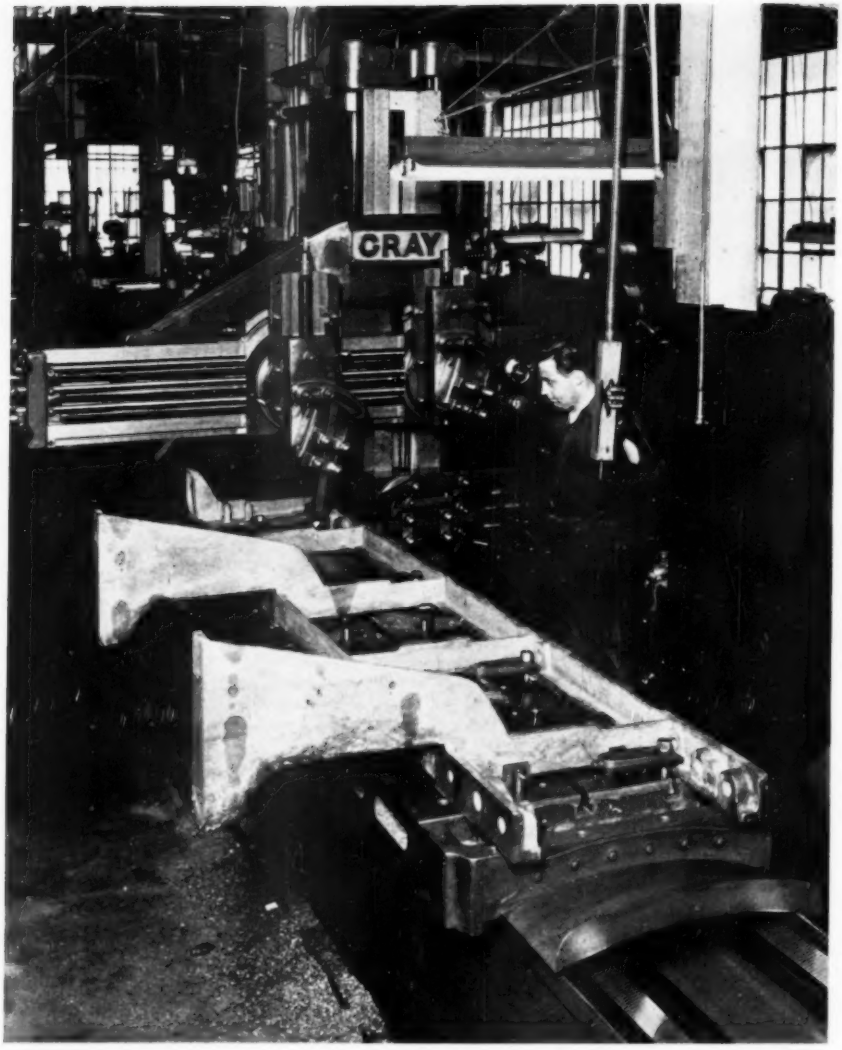
*PATENT PENDING

USS

UNITED STATES STEEL



A BIG JOB... *planed quickly and easily on the*

GRAY OPENSIDE PLANER CUB

The R. A. Jones Co., Inc., Cincinnati, has many small lot planer jobs. The Jones Cartoner side frame pictured is typical. Carbide Tools are regularly used and planing accuracy is greatly improved on this powerful, high-speed planer. Here, a Gray Openside Planer Cub produces as much as 3 old machines. Its versatility and productivity make the new Gray Planer a real cost cutter.

The G.A. **GRAY** *Company*

planers • milling planers
planer type milling machines
horizontal boring machines

CINCINNATI 7, OHIO, U. S. A.
SOLD IN CANADA BY UPTON, BRADEEN AND JAMES, LTD. • SOLD IN LATIN AMERICA BY MACHINE AFFILIATES

CLEEREMAN DRILLING MACHINES

secure REPEAT ORDERS on the basis of PERFORMANCE

Cleereman Drilling Machines have introduced a new conception of drilling machine performance.

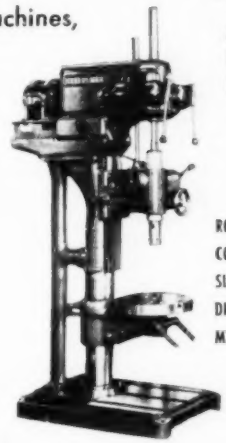
That is why present users send repeat orders . . . they know from their own experience exactly what Cleereman Drilling Machines will do. Prospective users want Cleereman after they have checked performance and maintenance records.

If you do not now use Cleereman Drilling Machines, let us refer you to an installation for your personal inspection.

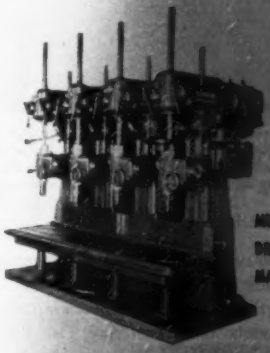
Write for Catalogs.

#325 SINGLE UNIT SLIDING HEAD DRILLING MACHINE

BOX COLUMN SLIDING HEAD DRILLING MACHINE



ROUND COLUMN SLIDING HEAD DRILLING MACHINE



MULTIPLE DRILLING MACHINE

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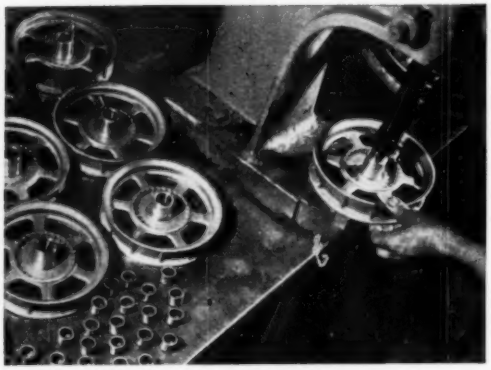
Affiliated with—

CLEEREMAN MACHINE TOOL CO. Green Bay, Wis.

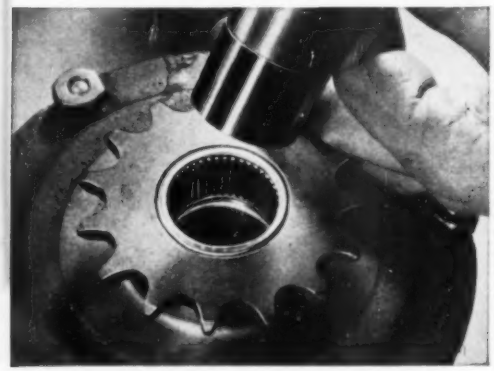
BUILDERS OF PRECISION JIG BORERS AND DRILLING MACHINES

Torrington Needle Bearings Reduce Friction, Simplify Design for Coldwell-Philadelphia Lawn Mowers

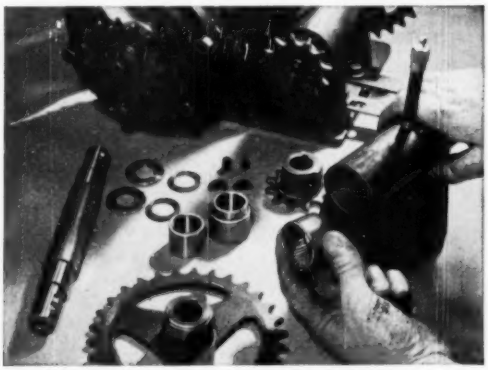
Power requirements are reduced by the smooth anti-friction operation of Torrington Needle Bearings in mowers built by Coldwell-Philadelphia Lawn Mower Company. Needle Bearings also provide high radial capacity to take the shock of rough service.



Quick, easy installation of Needle Bearings in mower wheels cuts assembly costs. Only a plain machined bore is required for a housing. No snap rings, shoulders or other retaining devices are needed. These Needle Bearing features mean simplicity and economy.

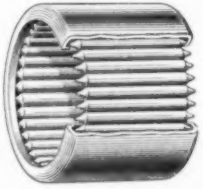


Lubricant is retained over long periods of service by the close-fitting, turned-in lips of Needle Bearings. In the gang unit cutter clutch gear, above, this construction also helps exclude moisture and dirt. Long service life is secured with minimum maintenance.



A space-saver indeed! A large main clutch shaft is supported in a relatively small housing, thanks to the compactness of Needle Bearings. This construction, plus the tremendous load capacity of these anti-friction units, means a lighter, sturdier mower.

You can gain the benefits of anti-friction operation in a space-saving and weight-saving design with Torrington Needle Bearings. Our engineers will be glad to help you adapt these high-capacity units to your requirements. Write us today. THE TORRINGTON COMPANY, Torrington, Conn., or South Bend 21, Ind. District offices and distributors in principal cities.



TORRINGTON *NEEDLE* **BEARINGS**

Needle • Spherical Roller • Tapered Roller Straight Roller • Ball • Needle Rollers

Precision Broach Manufacturer Gets

25% TIME SAVING

with New "KING-Made"

Sebastian LATHE

CONANT TOOL & ENGINEERING CO.

MANUFACTURERS OF PRECISION BROACHES
RECONDITIONERS OF BROACHES AND PERISHABLE METAL CUTTING TOOLS
JOBBERS OF METAL CUTTING TOOLS & GRINDING WHEELS & DIAMOND TOOLS

COMMODORE 0400

347 WEST 107TH STREET — CHICAGO 28, ILL.

January 12, 1949

Donberg & Danite
400 South Clinton Street
Chicago, Illinois

Attention: Mr. Theo. Fieldman,
Sales Promotion & Advertising

Gentlemen:

We have been operating in our plant since about the middle of October a 20 x 120" Sebastian Lathe which was purchased from your Company, and we are more than pleased to tell you of the fine results it has given us.

We have been roughing out large round broaches made of 18-4-1 high speed steel up to 8-1/2" in diameter by 62" overall length, adaptor plates and broach horns up to 16" in diameter, and we have done a considerable amount of thread cutting and find the machine to be very satisfactory in every respect.

Since we have been using this machine we have realized about a 25% saving in time and when in the market for additional equipment would have no hesitancy about purchasing additional Sebastian Lathes.

Yours very truly,

CONANT TOOL & ENGINEERING COMPANY

E. D. Conant, President

EDC:ane

20" Sebastian Lathe with 10' bed, roughing out teeth for involute spline broach at Conant Tool & Engineering Company.

●

You'll buy performance like this when you specify Sebastian Geared Head Lathes. The modern Sebastian is widely recognized as an outstanding leader in dependable accuracy, ease of operation, long service life.

This decidedly *finer* lathe is manufactured by "King," to the same precision standards which have made KING Vertical Boring & Turning Machines renowned the world over.

For illustrated description and specifications, write now for Catalog S-1 (Standard Lathes) and S-101 (Special Type Lathes—Gap, Clutch & Brake, etc.)

Standard Lathes in 12", 16", and 20" sizes. All lathes equipped with 8-speed geared head.

American Steel Foundries

KING MACHINE TOOL DIVISION

CINCINNATI 29, OHIO

Builders of King Vertical Boring & Turning Machines and Sebastian Lathes

ARMSTRONG
TOOL HOLDERS...
for the toughest steels!

The "Armstrong System" provides special ARMSTRONG TOOL HOLDERS for ARMALOY (cast alloy) and for ARMIDE (carbide-tipped) cutters. With these modern cutting tools, the toughest and hardest steels are easily machined. Far heavier feeds and the extremely high cutting speeds become practical (300 f.p.m. with ARMALOY cutters; 600 f.p.m. with ARMIDE cutters). Delays for tool re-grinding are reduced to an absolute minimum—edges hold up to 100 times as long.

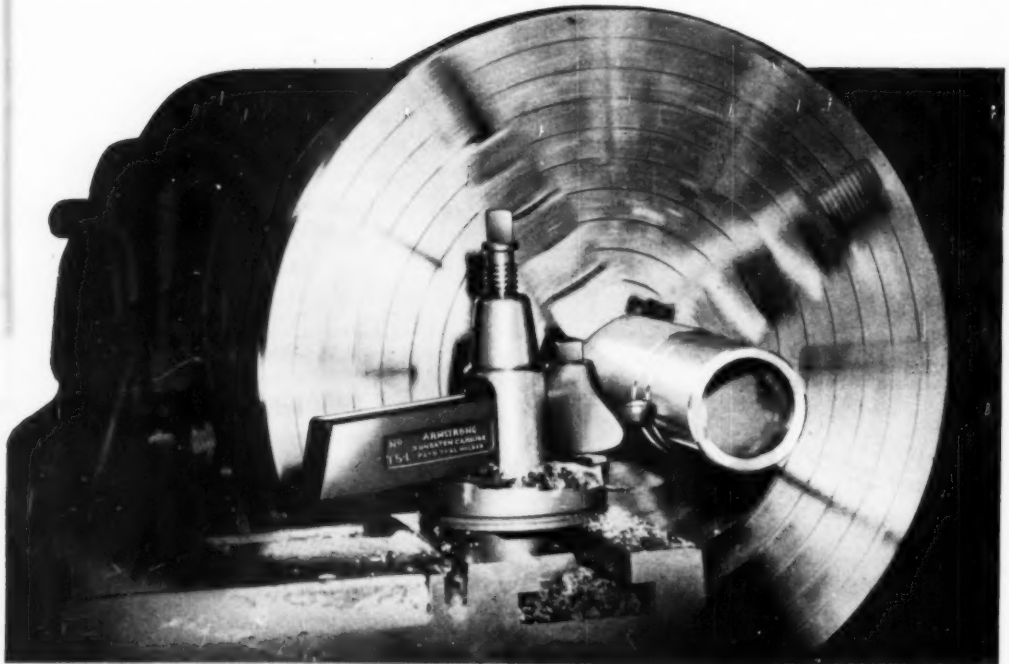
These new tool holders and cutters are stocked by your Local ARMSTRONG industrial distributors.

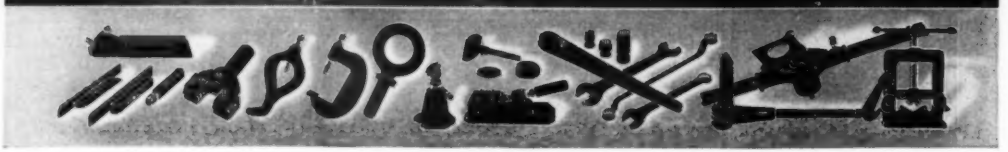
WRITE FOR CATALOG

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

5215 West Armstrong Ave. **Chicago 30, U.S.A.**





How TIMKEN® bearings give this headstock a head start in precision

MAXIMUM precision for long years of service is an advantage that's designed right into this Sidney Machine Tool Company 32-speed lathe. The spindle and all other headstock shafts are mounted on Timken® tapered roller bearings.

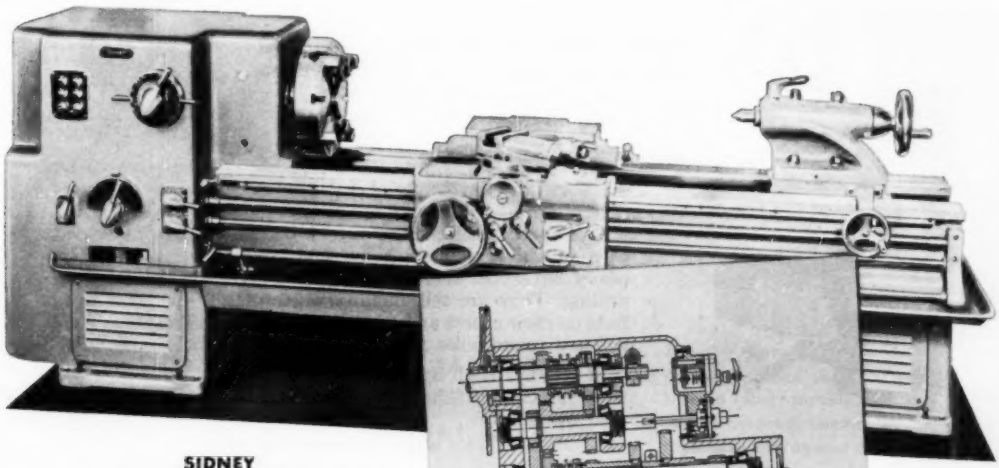
Timken bearings assure greater accuracy because they keep shafts rigid, yet free to rotate easily. They eliminate deflection and end-movement. They lengthen machine life by reducing wear on adjacent parts.

Because Timken bearings have *line contact* between rolls and races, they can carry greater loads. And their *tapered* construction takes both radial and thrust loads in any combination, permits preloading to any degree called for.

Timken bearings are built for long, tough service. They're made of special analysis Timken fine alloy steels and manufactured to amazing limits of accuracy.

This combination of advanced design and quality construction has made Timken bearings first choice throughout industry. That's why Timken bearings are a valuable added sales feature for your product. Make sure the trade-mark "Timken" is on the bearings you buy. The Timken Roller Bearing Company, Canton 6, Ohio. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.



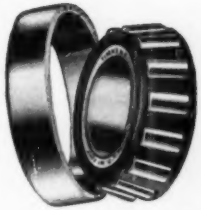
SIDNEY
MACHINE TOOL COMPANY
gets greater machining accuracy with Timken bearings on spindle and intermediate headstock shafts.

NEW TIMKEN BEARING CUTS RUN-OUT IN HALF!

Until now, the Timken "Zero" bearing has been the last word in bearing accuracy. Now Timken offers industry the "Double-Zero" bearing—*twice as accurate* as the "Zero"! Maximum run-out of the new "Double-Zero" bearing is only 75 millionths of an inch—*half* the 150 millionths run-out of the "Zero" bearing.

What an opportunity for manufacturers of machines where extreme accuracy is essential! Available in standard single row types, up to 10" O.D. Write for further information.

TIMKEN
TAPERED ROLLER BEARINGS



NOT JUST A BALL ◯ NOT JUST A ROLLER ▭ THE TIMKEN TAPERED ROLLER ▭ BEARING TAKES RADIAL ▯ AND THRUST ▯← LOADS OR ANY COMBINATION

Cut...

LARGE HOLES

. . . thru any machineable material up to *ONE INCH* thick!

Here is a premium tool which makes it possible to saw holes in one short operation . . . large holes which heretofore had to be laboriously machined "a-chip-at-a-time."

MARVEL High-Speed-Edge Hole Saws have strength to withstand the terrific peripheral strains of heavy duty operation in lathes, drill presses or portable power tools. They have a high speed steel cutting edge which is electrically welded to a tough, alloy steel body, high speed steel pilot drills, heavy hexagonal shanked arbors and sufficient set for deep drilling. They are self-aligning, as the larger diameter saws float on their arbors and are driven by double drive pins. They will saw round holes accurately in any machineable material.

MARVEL High Speed-Edge Hole Saws come in 35 sizes, from ⅝" to 4½". They are carried in stock by leading industrial distributors.

WRITE FOR BULLETIN ST-49

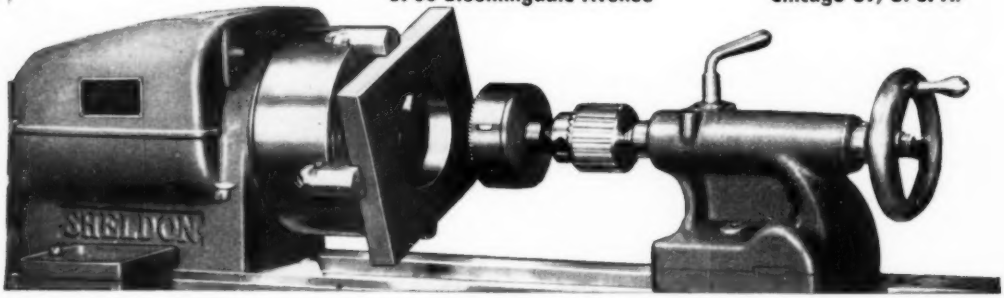
"MARVEL" *has Always had the edge!*

MARVEL *Metal Cutting* **SAWS**

ARMSTRONG-BLUM MFG. CO.

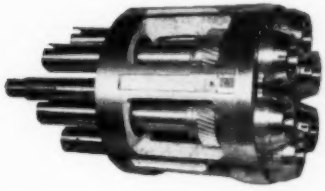
"The Hack Saw People"

5700 Bloomingdale Avenue **Chicago 39, U. S. A.**



MAINTENANCE BEGINS WITH DESIGN

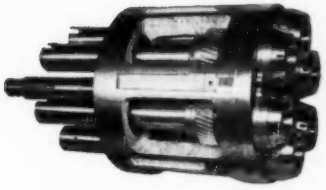
Buyers look for the "hidden dollars saved" in good Machine Design. They know it pays to see beyond a purchase price that might turn out to be a mere down-payment. Upkeep and replacements can be very costly.
Builders of multiple spindle automatics know the importance of a well-designed work spindle carrier. It has been referred to as the "heart" of accuracy. If you are an automatic user, you can quickly check on the maintenance dollars to be saved through the design of the Conomatic Carrier.



INTEGRAL

DRUM TYPE

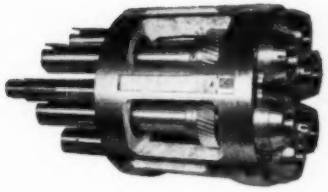
Heavily ribbed, integral, drum shaped design, for adequate resistance to torsion strain under the heaviest of loads.



GREATER

LENGTH

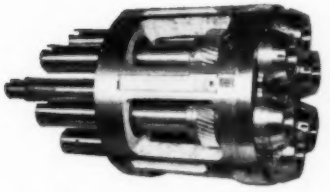
Greater length, for better alignment of work and for greater bearing area of work spindles. Driven gears in balanced position for better distribution of load on spindles and bearings.



TAPERED

FRONT BEARING

Exclusive tapered front bearing for the only combination radial and end thrust take-up facility provided by any multiple spindle automatic carrier. It is an important safeguard against deflection.

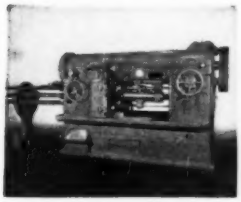


FREE OF

CROSS SLIDE PRESSURE

Rugged support of work, and relief from cross slide pressure by the block measurement positive stop provision against the machine frame, insure the maintenance of form tool and endworking tool operations to closer limits and quality finish.

#4



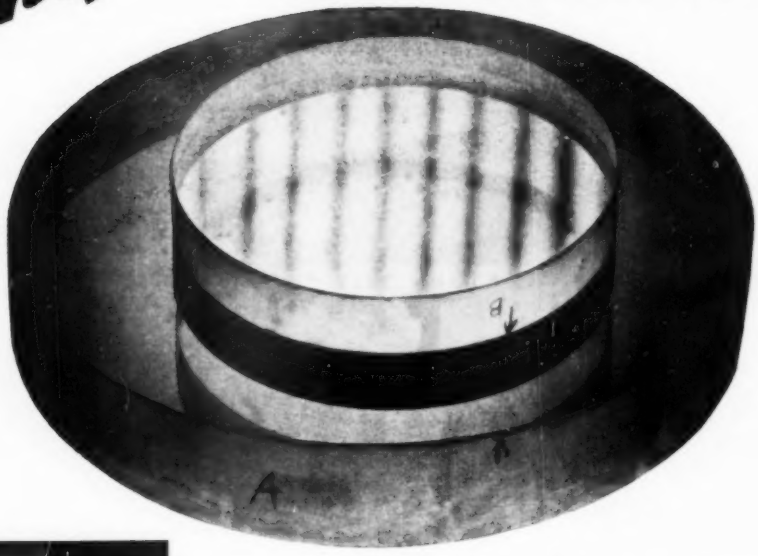
A comparison with ALL Automatics will lead you to

Conomatic

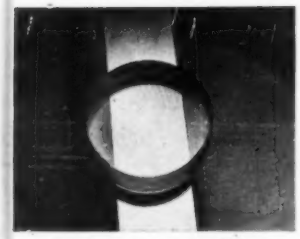
CONE AUTOMATIC MACHINE COMPANY, INC.
WINDSOR, VT., U.S.A.

Van Keuren OPTICAL FLATS
are the proof of Precision

BOSTON ◉——



——◉ NEW YORK



Detecting worn spot on amplifying gage anvil.

Checking flatness of lapped shoulder on a shaft with a special 3" diameter x 29/32" hole Fused Quartz Optical Flat.

IF the 10" diameter Van Keuren Master Flat shown above were extended from New York to Boston, the surface would deviate from a true plane less than 1".

Insist on having Van Keuren Fused Quartz Optical Flats. They are beautifully finished and are of superlative accuracy on both sides. They are the best buy.

IF YOU HAVE A PROBLEM

of testing flat surfaces, send us a sample part for examination and report.

CATALOG AND HANDBOOK NO. 34

THIS 208-page volume represents 2 years of research sponsored by the Van Keuren Co.

It presents for the first time in history a simple and exact method of measuring screws and worms with wires.

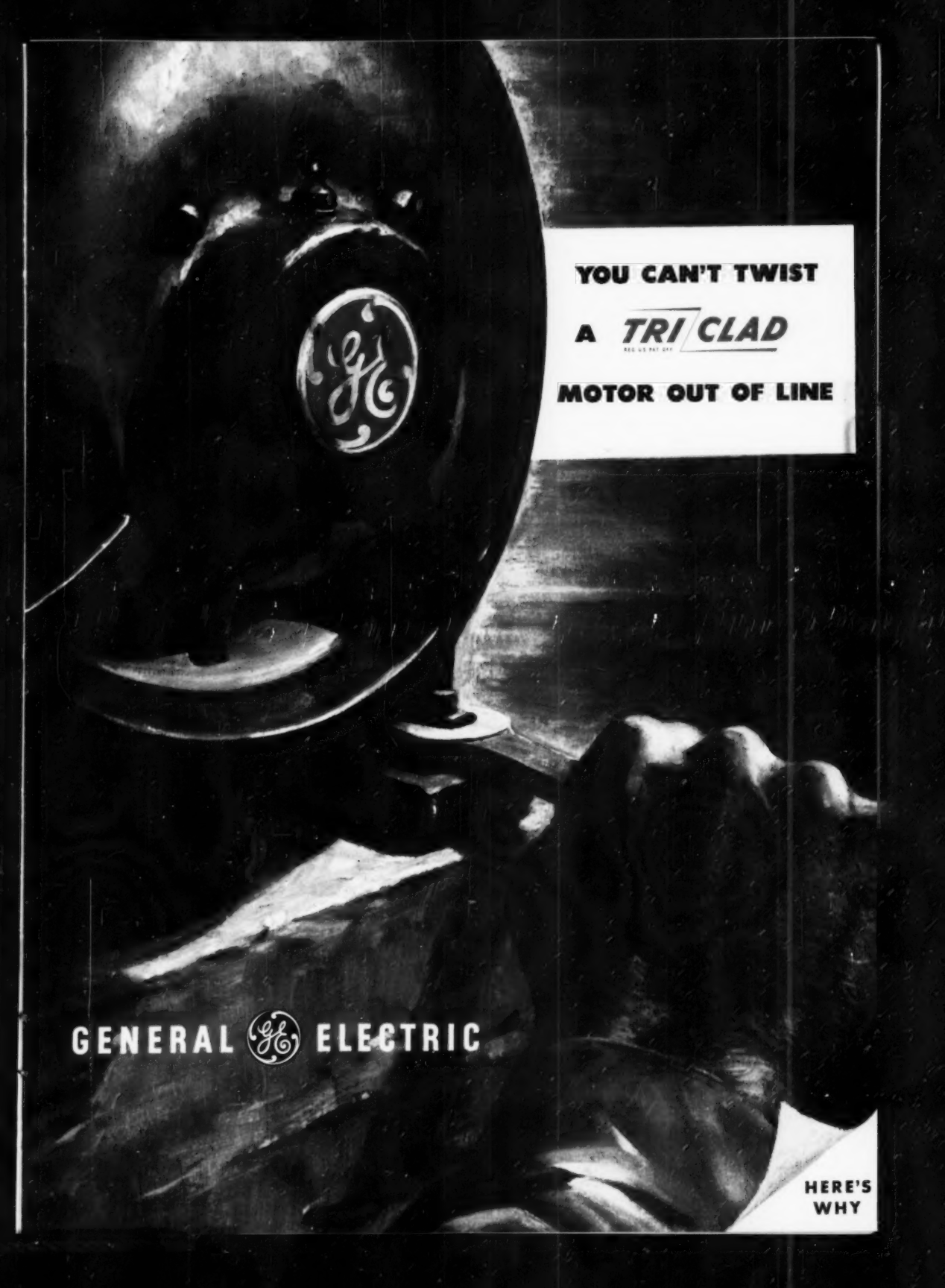
It tells how to measure gears, splines and involute serrations. It is an accepted reference book for measuring problems and methods.

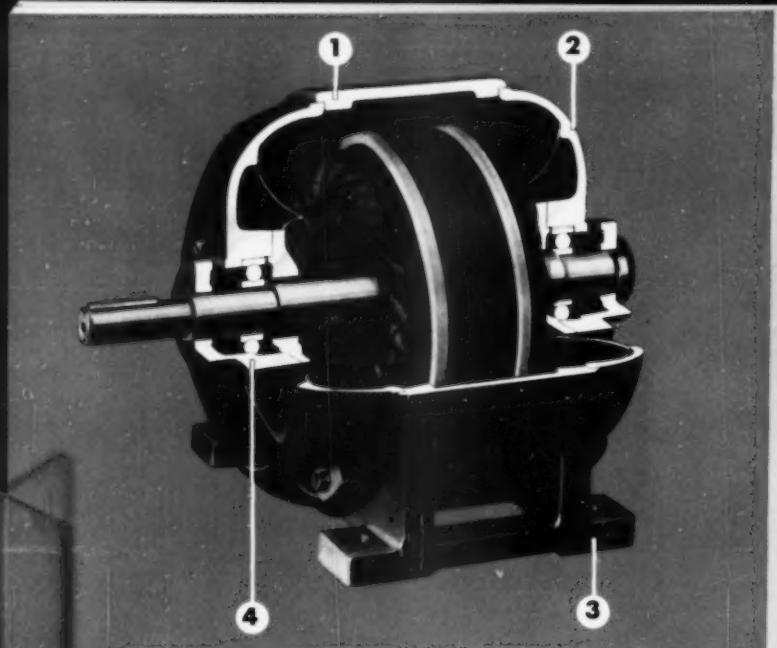
Copies free upon request.

THE Van Keuren CO., 173 WALTHAM STREET, WATERTOWN, MASS.

30th YEAR

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Plug Gages • Carboloy Measuring Wires


YOU CAN'T TWIST
A TRI CLAD
REG U.S. PAT OFF.
MOTOR OUT OF LINE
GENERAL ELECTRIC
HERE'S
WHY



Look at the solidity of a Tri-Clad's thick-section cast-iron frame (1) and heavily reinforced end shields (2) . . . its heavy integrally cast feet (3). Do you wonder we say "Tri-Clad gives you structural strength and rigidity no other general purpose motor can match"? Notice, too, the *completely enclosed* bearings (4). A Tri-Clad motor will run safely without relubrication for years — as long as any general-purpose motor you can buy. Yet it's grease-gun easy to lubricate if you ever need to.

You can't twist a TRI CLAD motor out of line

Try as a heavy-muscled mechanic may, he can't twist a Tri-Clad motor frame when bolting it to an uneven surface. The bolt will snap before he can pull that rigid cast-iron structure out of line.

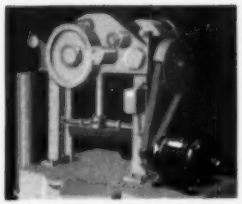
Important? It's one of the basic reasons General Electric believes cast iron to be the ideal structure for general-purpose industrial motors. Other reasons? Cast iron has unusually high resistance to rust and corrosion. It has an inherent damping action that minimizes resonance. And . . . it won't take on an injurious permanent "set" as a result of accidental blows or mechanical abuse.

Want a motor that's been **SERVICE-PROVED** in 5 billion hours of rugged industrial use? Nearly all types and ratings are **AVAILABLE FROM STOCK.**

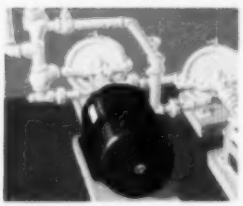
Apparatus Dept., General Electric Company, Schenectady 5, N. Y.

GENERAL ELECTRIC

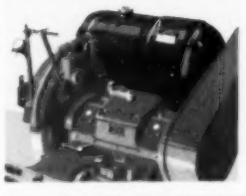
YOU CAN'T BEAT TRI CLAD EXTRA PROTECTION



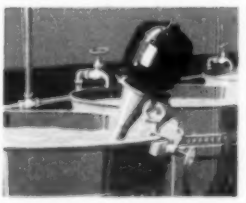
G-E open (dripproof) induction motors for constant-load, constant-speed applications. From 1 to 2000 hp.



G-E totally enclosed motors for outdoor operation, in abrasive dusts, or corrosive fumes. From 1 to 1000 hp.



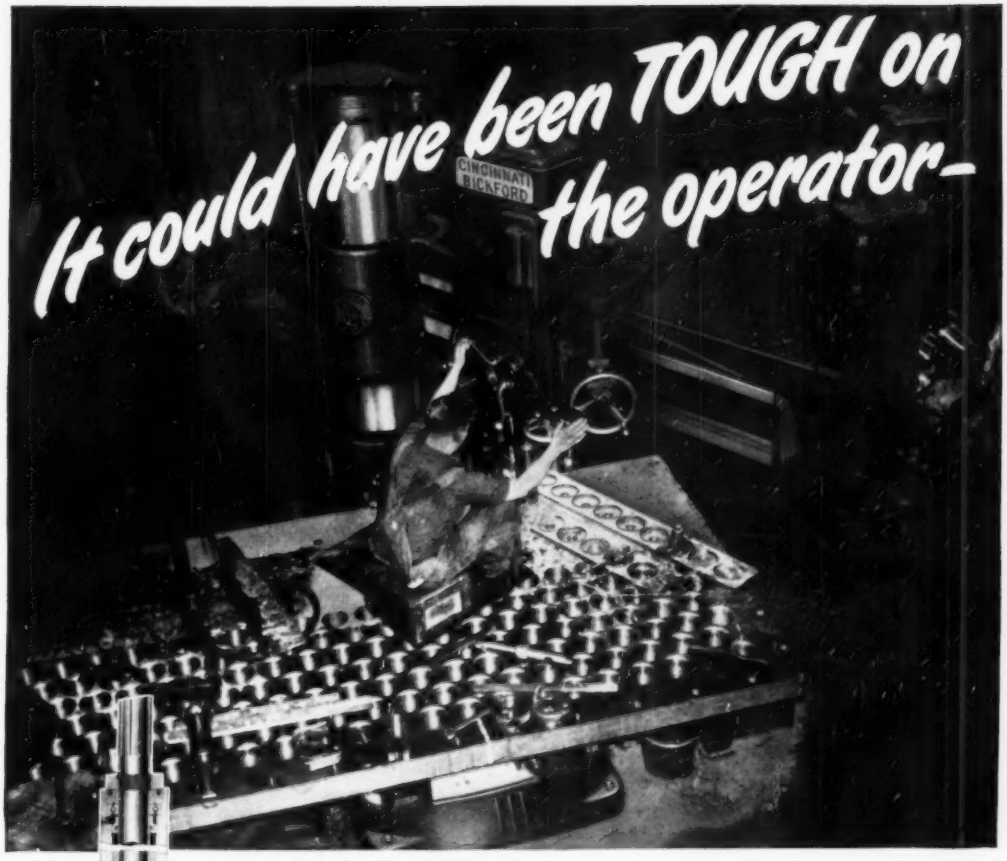
G-E Type ACA induction motors for adjustable speeds—provide 3 to 1 speed range. From 3 to 75 hp.



G-E flange and face-type motors for use where the machine supports the motor, or vice versa. From 1/20 to 60 hp.

Look for this **EXTRA** on the motor you buy!

It could have been TOUGH on the operator—



Contributing to the unusually long trouble-free performance of Super Service Radial Drills is the spindle and sleeve construction. Note that the sleeve and its spindle supporting bearings feed down with the spindle so that no matter what length of feed is required or how far the spindle is extended from the head, it never feeds away from its supporting bearings, but is always rigidly supported by these bearings just above the spindle nose.

Power, stamina, accuracy and concentrated operator control were all required on this job.

One drilling and two fly cutting operations were performed. Size of holes: 5", material 6½" armor plate. From a minimum of fifty holes to several hundred were produced per piece.

The Cincinnati Bickford Super Service Radial Drills give a sustained accurate and speedy performance—with maximum ease to the operator.

Write for Bulletin R-29 for details on this modern powerful radial drill.

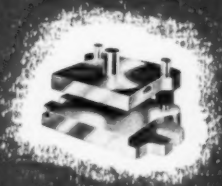
THE CINCINNATI BICKFORD TOOL CO.
RADIAL AND UPRIGHT DRILLING MACHINES
SUPER SERVICE

Radials 7½" dia. col., 2½' arm, to 96" dia. col., 12' arm.
General purpose Uprights, 21" to 28" sizes.
Production Uprights 21" to 28".
Jig Borers. Portable Horizontals.
Spacing Table Machines.

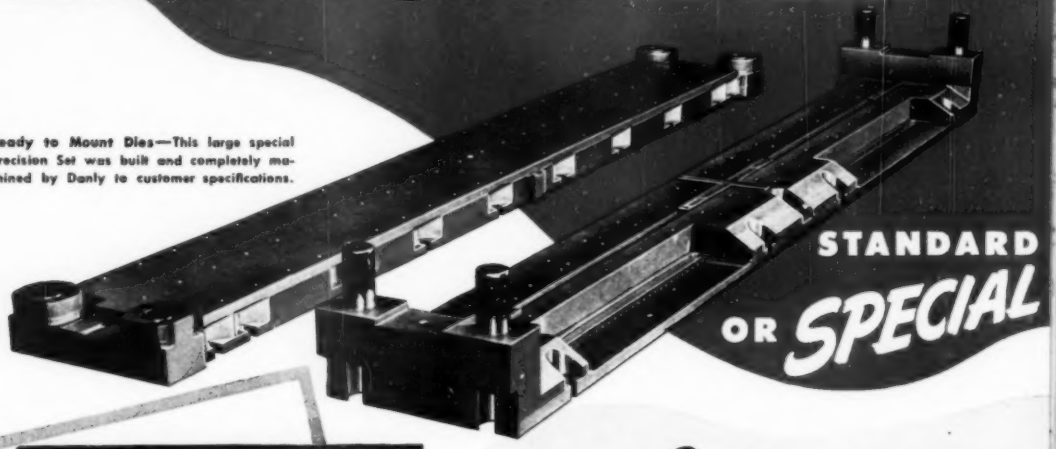
Equal Efficiency of Every Unit Makes the Balanced Machine

THE CINCINNATI BICKFORD TOOL CO. Cincinnati 9, Ohio U.S.A.

LARGE OR SMALL



Many Precision Die Sets—one of several thousand combinations available in standard sizes.



Ready to Mount Dies—This large special Precision Set was built and completely machined by Danly to customer specifications.

STANDARD OR SPECIAL

save time { USE DANLY NATION-WIDE DIE SET ASSEMBLY SERVICE

Danly Assembly Plants (marked with stars) are stocked with interchangeable parts for immediate assembly and quick delivery of standard die sets to your specifications.

- **Chicago 50,** 2100 S. 52nd Ave.
- **Cleveland 14,** 1550 E. 33rd St.
- **Dayton 2,** 990 E. Monument Ave.
- **Detroit 16,** 1549 Temple Ave.
- **Grand Rapids,** 113 Michigan St., N.W.
- **Long Island City 1,** 47-28 37th St.
- **Los Angeles 54,** Ducommun Metals & Supply Co., 4890 S. Alameda
- **Milwaukee 2,** 111 E. Wisconsin Ave.
- **Philadelphia 44,** 18 W. Chelten Ave.
- **Rochester 4,** 16 Commercial St.

WRITE FOR THIS *Free* BULLETIN

Get more details on how you can more effectively use Danly's machining service for special die sets to save additional time and money. Write for free bulletins.

DANLY *Precision* DIE SETS

ARE BUILT FOR ALL TYPES OF PRESS OPERATIONS

The Precision Die Sets above are typical of the wide range of steel and semi-steel types built by Danly to serve every need of the stamping industry. The small set is one of the several thousand combinations in standardized sizes which are available and stocked as cataloged items. The unusually large set is a special on which more than 600 drilling, reaming, tapping, boring, milling and planing operations were performed. The set is completely machined ready for mounting dies.

Danly Special Machining Facilities Help Speed Die Deliveries

Danly's complete machining and handling equipment is available for any required work on die sets of any size or shape. The necessary machining for mounting dies can be handled efficiently at the time the die set is produced. This special machining by Danly saves time for tool rooms and die shops, and helps speed die deliveries. It permits devoting die making equipment and personnel exclusively to die work. Perhaps you can use this type of service on your next job. Ask for special quotations.

DANLY MACHINE SPECIALTIES, INC.

2100 SOUTH 52nd AVENUE • CHICAGO 50, ILLINOIS

DANLY

OVER 25 YEARS OF DEPENDABLE SERVICE TO THE STAMPING INDUSTRY

PRECISION DIE SETS . . . STANDARD AND SPECIAL

SPOT NEWS OF METALWORKING

Chevrolet has ordered a $380,000 controlled-atmosphere furnace, to be delivered in September, for copper-brazing the new torque converter. That means the torque converters won't be available until 1950 models, and that it is a steel-stamping assembly instead of a cast design.

"Airlift" version of its grinding machine has been made by Fritz Werner machine tool plant in U.S. sector of Berlin. It is smaller than conventional type and could be broken down into three sections for shipment in C-82's. During blockade Werner received monthly allocation of 77 short tons of fuel, 33 tons of sheet metal and 20-33 tons of pig iron by air.

New type of gas burner with laminar gas flow is reported to yield a sensationally high output per cubic foot of burner cavity. One-inch diameter burner is said to release over 2 million btu per hr. from a gas-air mixture.

Most automobile makers are planning production only 30 days ahead and are feeling their way along. This is tough on parts companies which must make 60-90 days' commitments on raw materials.

Eight major steel producers have placed orders for a new 32-in. lathe which turns chilled-iron rolls at about 12 times the speed previously thought possible. It contours rather than form-cuts, will replace a number of the old roll lathes now in use.

Studebaker's new press department at South Bend cost more than $3 million, has 61 new presses ranging from 75 to 750 ton capacity, will be tooled with entirely new dies. All front and rear fenders, hoods, gas tanks, tire wells, grilles and instrument panels for passenger cars will be made there.

CIO electrical workers have asked General Motors not to cut wages below what they were last June under their cost-of-living escalator clause. The contract permits wages to drop five cents below that level, not counting a three-cent "improvement factor" adjustment due next month.

Dutch imports of quality steel products from Britain, Canada, and the U.S. will be cut when Netherlands Steelfactories de Muinck Keizer of Utrecht, the largest Dutch steel foundries, builds a large forge shop for its own needs.

ECA allocations for U.S. machine tools during fiscal 1950 are: France $17.2 million; Italy $15 million; United Kingdom $14 million; Sweden, Switzerland and The Netherlands $5 million each; Belgium $3.7 million; Bizonal Germany $3.4 million; Austria $2.8 million; Denmark $3 million; and Norway $2 million. Other nations are participating on a much smaller scale.

Shell turning lathe was shown by British builder at recent Prague Fair. Builder is reported to be soliciting orders for it wherever he can get them.

Substantial amount of new equipment for manufacture of new automatic transmission for Studebaker is being purchased by Detroit Gear Division of Borg-Warner. Target date for starting production is before end of the year.

New knew-type milling machines, with built-in chucking table to simplify workholding problems, are being brought out by a prominent machine tool builder. These machines facilitate handling of irregularly shaped workpieces without resort to costly special tooling and fixtures.

Gaging Metalworking

The metalworking industries still are in the process of settling down onto a lower basis than the recent postwar peak. The AMERICAN MACHINIST Index shows that April operations, based on manhours worked, were down three points from 211 to 208, with 1939 taken as 100. All components of the index except automobiles were off. It is probable that the figure for May will be slightly lower than April's. Bear in mind, however, that metalworking output, as measured by manhours and not by inflated dollars, is somewhat more than double the 1939 rate.

Several factors are contributing to this leveling process. Many managements are hesitant at the moment about placing orders until they have a better idea of tax and labor policies under which they must live. In the consumer field some prospective customers are holding off until they feel that prices are not going substantially lower. This is especially true in household appliances. Above all, the fat postwar backlogs have been sliced into by unprecedented production which has been ahead of normal replacement demand.

► Downward readjustment of inventories is looming importantly as a brake on releases of raw materials and components. One large metalworking firm making a variety of products has whittled its inventories from six months' to three months' supply and expects to do some further pruning. Another is down to a six-weeks' basis. Foundries report that customers are waiting until the last minute to place orders and often will drive their own trucks to the foundry door to pick up castings which have hardly had time to cool. These cases are typical of what is going on throughout metalworking.

These happenings have a cheerful aspect. Inventories are being shaken down to the point that in many instances any improvement in orders will be reflected almost instantly in a pickup in production. Mostly, metalworking companies are on a 40-hour single shift basis and have pared their working forces a bit as business slackened.

Drop in Machine Tool Orders

April brought a sharp drop in machine tool orders, according to preliminary figures of the National Machine Tool Builders' Association. The NMTBA Index stood at 71, against 86.3 the previous month. Shipments also dipped to 77, compared with 83 in March.

Export business, almost exclusively originating in ECA financing, bolstered April bookings. Foreign orders amounted to 27% of the total. It is likely that ECA-stimulated buying will drop off until after the new ECA fiscal year begins July 1.

► Best estimates are that machine tool shipments to ECA countries thus far this calendar year have been around $35 million, but actual orders received during this period have been $25 million. In the 1950 fiscal year ECA machine tool business placed with American builders will run around $75 million if all the allocated funds thus are used.

Italy and France have been and probably will continue to be the heaviest purchasers. Fiat has been distributing substantial orders among U. S. builders. At first it was believed that Fiat would use its own funds to pay for these machines. But recently ECA is reported to have entered into proceedings. Builders are complaining about the excessive red tape connected with official confirmation of ECA business. Because of the dire shortage of dollars outside ECA countries and competition from foreign machine tools companies, the amount of U. S. machine tool orders for export originating this year outside western Europe probably won't run over $5 million.

Domestic Sales Uncertain

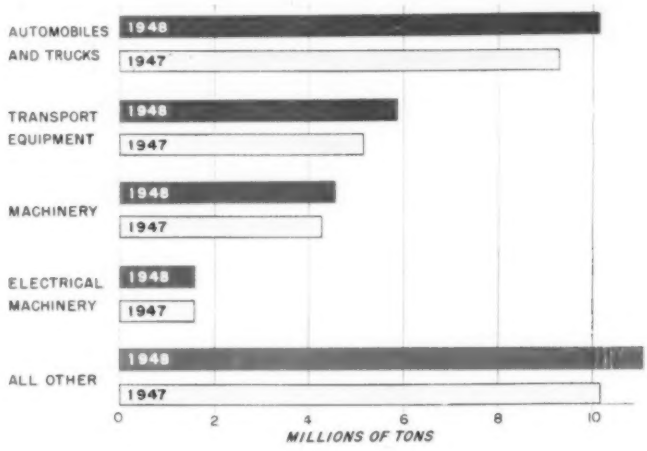
Main uncertainty is what turn domestic sales are likely to take. The outlook for machine tool sales in the automotive industry, usually the best buyer, is dim. Big tooling programs for 1950 are conspicuously absent. The chief hope is that a prominent automobile company will go ahead with its plan to bring out a completely new engine.

► Farm implement and tractor output has been at an all-time high as manufacturers have been busy "filling the pipelines." However, initial signs that present operations can-

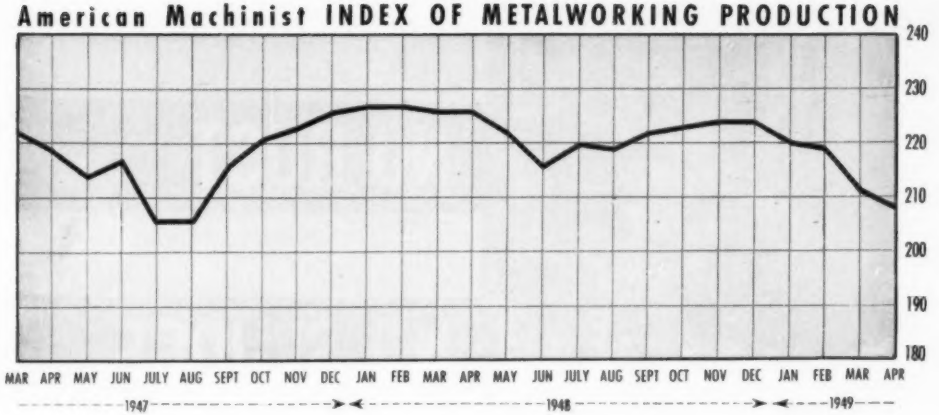
STEEL CONSUMPTION

	1948	1947
AUTOMOBILES AND TRUCKS	10.2	9.3
TRANSPORT EQUIPMENT	5.9	5.2
MACHINERY	4.6	4.3
ELECTRICAL MACHINERY	1.6	1.6
ALL OTHER	11.1	10.2

Source: American Iron & Steel Institute
McGraw-Hill Dept. of Economics



American Machinist INDEX OF METALWORKING PRODUCTION



INDEX		COMPONENTS				
		MACHINERY	ELECTRICAL MFG.	AUTOS, TRUCKS	TRANS-PORTATION EQUIP.	OTHER METAL-WORKING
Apr. 1949 (preliminary)	208	222	203	219	294	142
Mar. 1949 (revised)	211	232	211	216	301	144
Apr. 1948	226	249	237	228	293	183

AMERICAN MACHINIST'S INDEX OF METALWORKING is based on manhours worked in five segments, which are "weighted" as follows: Machinery, 32.5—Auto & Trucks, 22.6—Electrical Manufacturing, 15.4—Transportation Equipment, 12.4—All Other Metalworking, 17.1. Index figures are a percentage of 1939, which equals 100.

not long be sustained are appearing. April sales were off from the same month a year ago, the first time that this has occurred since the war's end. The last half of the year promises a leveling off of production onto a high plateau.

Household appliance makers have been hit by lack of a normal seasonal upturn in retail sales. They generally have cut their factory schedules and have laid off workers.

Television Is Bright Spot

Makers of television sets are breaking all records. Here is one of the bright spots in metalworking. One manufacturer, for example, is producing 10,000 sets a week. This output exceeds by a considerable margin its assemblies of radios and radio-phonograph units. Demand for television is expected to stay on a high plane and is being aided by the easing of installment selling terms under Regulation W.

Main obstacle to appliance purchases at the moment is the reluctance of the public to buy at current prices. People have the feeling that prices may come down sharply, hence they will wait awhile. But makers point out that it is impossible to "break" prices to the extent that the public hopes for. As soon as prospective buyers are convinced that retail prices will not decline much farther, it is believed sales will pick up and the retail market be stabilized on a reasonably high plateau.

Turbines at Full Capacity

Production of turbines and generators is staying at full capacity. Manufacturers still are booked well up into 1951. New facilities now coming in will be busy for at least the next year or two.

▶ Fractional horsepower motors are not doing so well, because of the falling off in assemblies by user companies and because of accumulated inventories. Business in integral motors is much better than in the fractional units. Large-size electric motors are selling the best of all. Manufacture of electric transformers is continuing close to the postwar peak. Electric instrument and meter sales and production are off, demand having dropped abruptly.

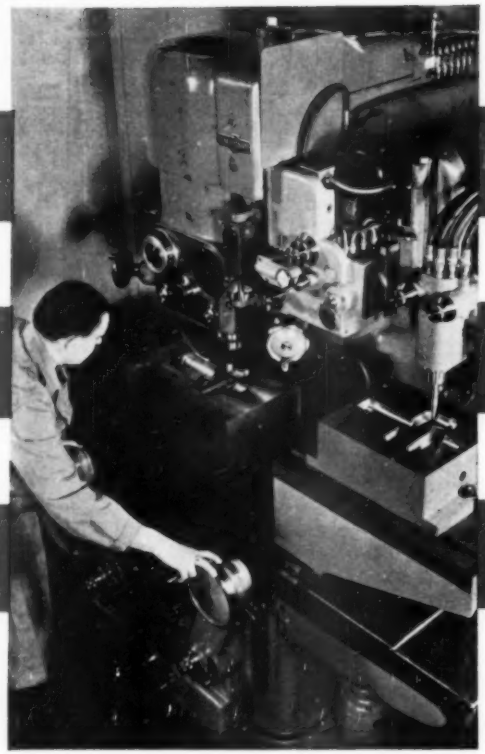
Few Freight Car Orders

Diesel-electric locomotive builders report that their operations are unaffected as yet by the general downturn in business. Railroads are pushing for deliveries on orders. But new orders are not up to current shipments and backlogs are fading considerably. A strange phenomenon has occurred in the freight car field: inquiries are almost non-existent. Car builders attribute this lack to a tug-of-war between railroads and steel companies, the carriers insisting that steel prices must come down before they will buy more cars. Apart from that fact, railroad car loadings are off and a natural decline in car purchases appears in order.

Steel Readily Available

Steel obviously is more readily available than it was. And steel mills are vigorously soliciting orders, something they haven't done for years. Users are gradually reverting to their prewar practice of keeping stocks down and counting on prompt deliveries from mills to supply current or near-current requirements. Larger customers also are getting away from warehouse buying as they are able to fill their needs directly from the mills, as they formerly did.

▶ At present a number of companies are running in excess of 100% rated capacity to fill orders, although industry-wide April's 7,783,807 net tons, a record for that month, marked the first time this year that operations averaged less than 100% of capacity. Steelmaking furnaces were operated at 98.7% of capacity in April, compared with 102.7% of capacity in March. Operating rates are likely to drop a bit more, but the slide-off will be slight. There is wide speculation about what the steel-producing rate will be later on in the year. It is fair to say that it will be down some, but it still will stay relatively high. Mills are now revising their extras downward. Scrap is more plentiful and scrap prices are very much lower than they were.



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American Machinist

MAGAZINE OF METALWORKING PRODUCTION ★ ESTABLISHED 1877

Tell Your Story Boldly

There is an unfortunate tendency among manufacturers to be timid about telling their story to the public.

They seem afraid that their efforts will be tagged as propaganda. They have a defeatist complex about all agencies of the government, including Congress, being against them. They often fear the press. They hoard the facts about their business instead of revealing them to their neighbors, employes and townspeople.

Labor unions do not have such inhibitions. Instead of playing "hard to get," they are ready to set forth their beliefs any time, anywhere. Their newspapers, pamphlets and orators scream at the public all the time. And they always blow the loud, brassy notes instead of playing soft music.

Witness the UE campaign to win teacher support. The union has a kit labeled "A Message to Teachers From a Labor Union." In it are booklets and leaflets "on timely subjects from the labor point of view for classroom discussion." It also gives information on how to secure UE films and other "useful materials."

What the UE is doing, other unions are doing on a local as well as regional and national level. The same theme prevails: Industry is too greedy, profits are too high, prices of industry's goods are too high, wage rates are too low, workers are not treated as well as machines, the private enterprise system must be rigidly controlled and labor be given more rights for the greatest good of the greatest number.

As against this lurid performance, often couched in terms of sweet reasonableness, industry has done poorly, especially at the local level.

The few companies which have spoken out, like Warner & Swasey, have done a magnificent job. But not enough of them have done it. Industry is losing by default. Whenever anything constructive is done, management usually does it with the little finger of its left hand. And that is totally inadequate.

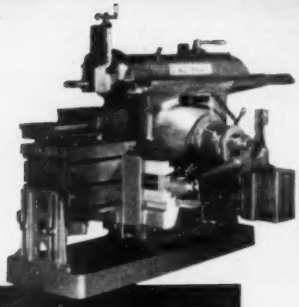
What is needed badly is for little companies and big ones, associations and individuals, to reinterpret our American system to the people. It can best be done by manufacturers locally. They can present the facts and figures familiar to the employes, their neighbors and the townspeople in general.

"Remember, silence gives consent," said Don Knowlton, speaking recently before the Society for the Advancement of Management. "If we are not willing to devote a fair share of our resources and our energy toward the defense of the system by which we live, how can we expect others to come forward and do it for us?"

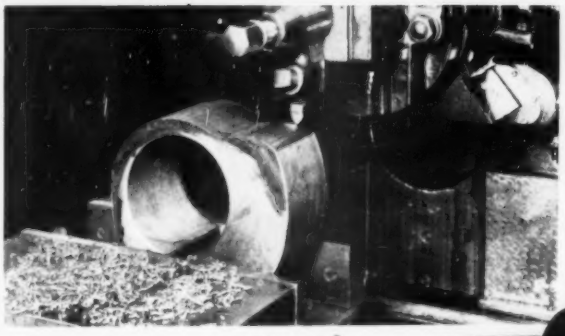
Burnham Finney

EDITOR

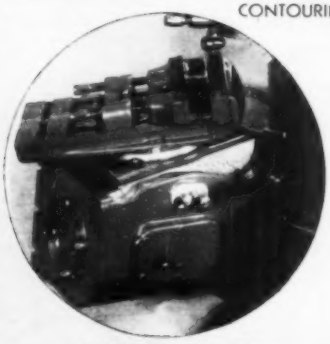
Use a SHAPER



INTERNAL SHAPING



CONTOURING



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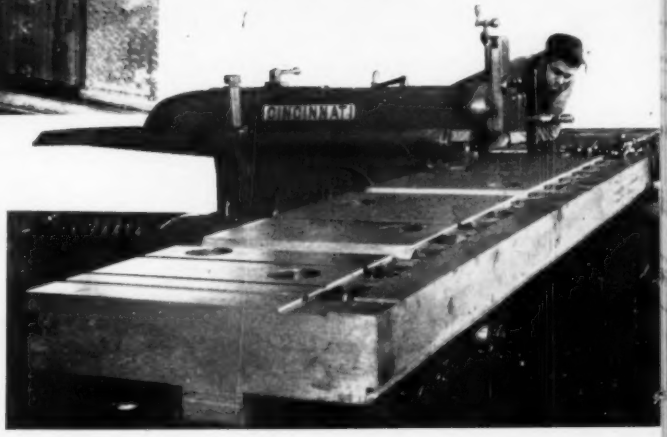

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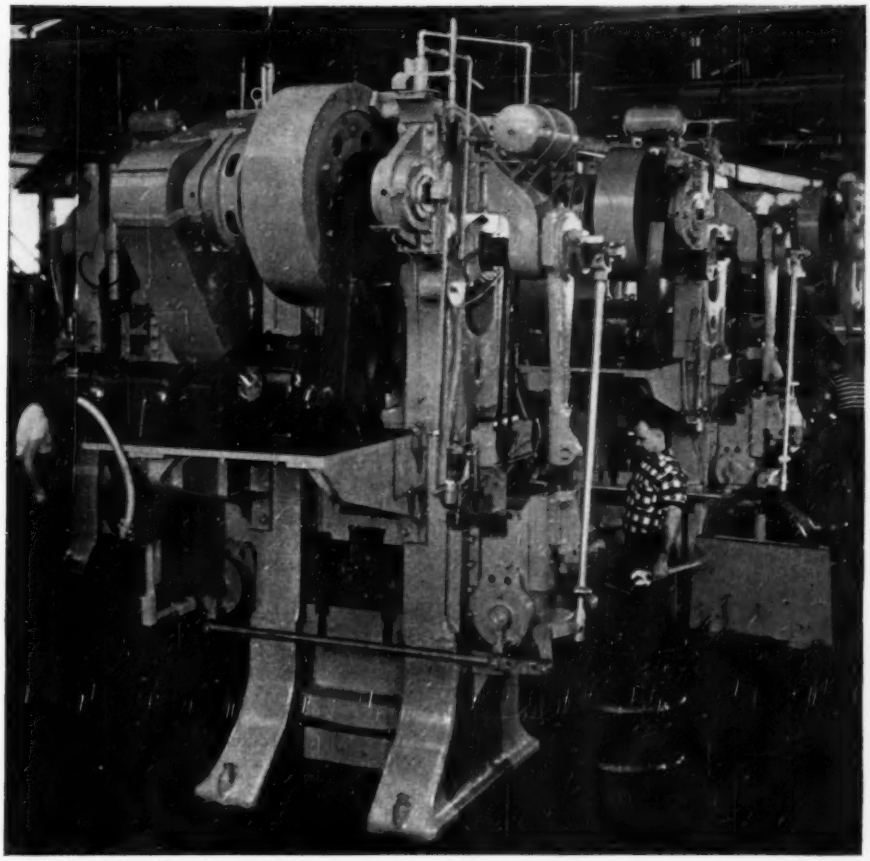

Press shop at Link-Belt's Ewart plant shows what color con do

How to Use MORE COLOR IN THE SHOP

BY CHARLES EMERSON, ASSISTANT EDITOR

PRETTYING up a traditionally dingy metalworking shop with fancy colors is an idea that runs contrary to the average mechanic's sense of values; but color, applied in the right places and in accord with good planning, can pay off—in production, morale, maintenance, and safety. Physically, color affects only the eye, but psychologically it affects every movement and thought to some degree. Whether this effect is to improve or damage a plant's operations depends upon where the colors are applied, what function they serve, and the colors themselves.

A SPECIAL American Machinist REPORT TO THE METALWORKING INDUSTRIES

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Color Contrasts Determine Their Effect

COLOR MUST BE PLANNED

Employees in a Pennsylvania wire-producing plant claimed that working there was like performing under a circus big top. The first color scheme applied to the machines consisted mainly of orange on the outside and yellow on the inside of whirling machine barrels—and it didn't take long for some of the men to contract green faces to match.

A shoe trimmer in another plant tried light green on his machine because he had trouble seeing the dark thread against the original dark bulk of the machine. The idea caught on all over the plant, with each man taking a paint can or two of his own choice and splashing up any or all parts of his own equipment. Just before the plant was completely repainted in a planned color scheme the place was compared to a Christmas tree gone mad. Both were horrible examples of how not to use color.

For decades men have worked on metal products in dark-colored, dull-looking shops where the only color the men didn't carry in with them in the morning appeared as a dull green in machine oil and a dull blue in high-carbon chips. A sudden change from such a somber picture to one of glorious pastels is just too much to expect—it isn't in the books. But planned color, on the other hand, can easily snap new life into even an ancient plant.

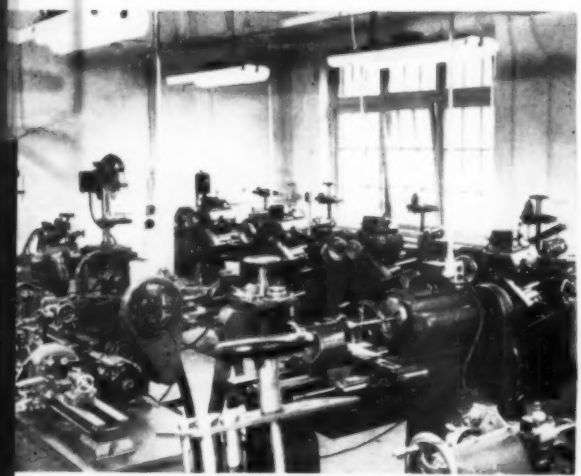
COLOR APPLICATIONS in a shop can be divided into two general classifications: Functional color, such as warning systems for safety and codes that identify parts, controls, and physical equipment; and Aesthetic color, the interior-decoration scheme that *should* produce an over-all visible effect of order, cleanliness, and efficiency.

One reason for careful attention to aesthetic coloring is the tendency for poorly planned schemes to distract workers from their jobs. If the decoration is to do more than simply cover rusty steel beams and pillars and stain-streaked concrete walls, it must be planned to blend with the shop interior. Distraction is one of the least-desirable byproducts of color. It is a matter of contrasts—not brightness.

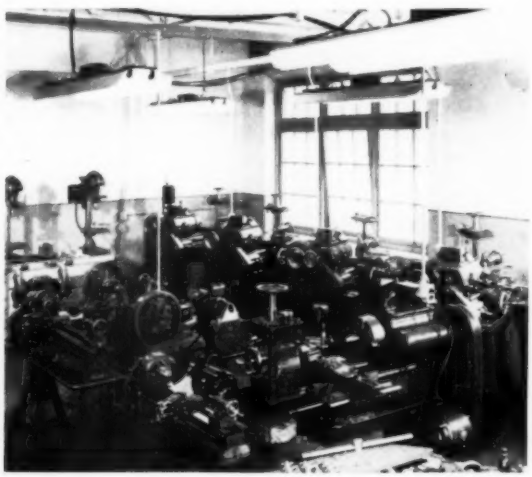
Properties of Color

Colors can be as bright as sunlight; yet, if they do not contrast with each other, they can have little or no distracting effect. Correctly planned interior colors provide a mood—a general psychological effect—but no startling contrasts. But even dull colors, *if their contrasts are high*, can cause psychological troubles that will be reflected in low output and bad morale. Contrasting colors can cause excess eye fatigue, jumpy nerves, and even physical pain to some susceptible workers.

Color contrasts can be related closely to one of the fundamental properties of all colors. These are:



Before *color was applied to Kent State Universitys' machine shop, the crowded interior looked badly organized, confused. Bare plaster walls and ceilings contributed nothing to the over-all effect, overhead fixtures looked cluttered*



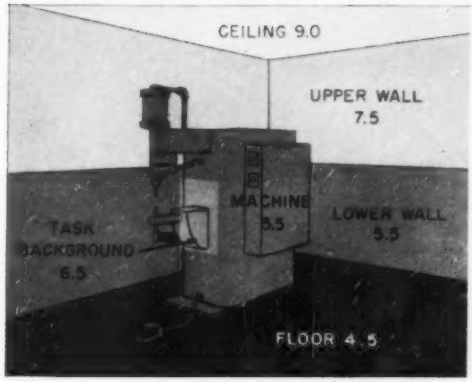
***After** color painting, the shop looked orderly and neat, despite the still-crowded arrangement. Machines were gray, ceiling was white, upper walls light blue, dados medium blue, and a strip separated upper walls and dado*

Hue—the primary characteristic of colors (and also their names) such as red, blue, green.
Chroma—the strength or weakness of colors.
Value—the lightness or darkness of colors.

It is *value* which can act as a guide to proper color contrasts inside a shop.

Value ratios, based on the almost universal Munsell color system, can be recommended for general plant applications. Ceilings must have the highest values—for good light reflection. Floors should usually have low values to reduce glare from below—except where it is essential to have light on the under side of a piece of equipment. Machines should not contrast too much with the walls behind them, for the worker will see both the machine and the walls as a background as he works.

Most plants will have trouble meeting these recommended value relationships without some special help. Many paint companies have experienced color experts who can devise special color systems for a given plant, or recommend already worked-out systems for general application.



***Contrast values** run from 1 to 9, with 9 indicating nearly white, 1 nearly black. Task backgrounds, like bench tops, tables, or painted machine slides, should be lighter than the machines. Lower walls and machines should be about equally light. High machines can be lighter near tops*

General Rules for Color

THERE ARE a number of general rules to follow in setting up an aesthetic color system—rules that anyone can conform to, even though the system may be informal and only applied in test areas.

The psychological effect of color is so telling that physical comfort, even in the hardest-working departments, can be made or lost by the tint applied. Blue and green are cool colors and give the impression of coolness, regardless of the physical conditions. They therefore should be used in hot places like heat-treat rooms and furnace rooms. Cold locations such as refrigeration rooms and poorly heated rooms in the winter can be made much more comfortable by the application of warm colors—red, tan, and yellow. The heat-affecting colors have even more practical values. Storage tanks containing materials that must be kept at an even temperature can be painted with aluminum or white paint which reflect a high percentage of radiant heat—whether inside or outside a plant.

The high-reflectance value of aluminum paint evens off the day-to-night heat cycle by reducing heat absorption during the day, yet allowing heat loss during the night.

These same heat-affecting colors have another property. The cool colors appear to recede, while the warm colors advance. This means that crowded shops can be made to appear more spacious by blue- or green-colored walls, benches, and machines. Large expanses of space in a plant—as in a large generator room—can be made to appear more normal by the application of reds and yellows.

Men prefer cool colors, but women prefer the warm hues. The fact that men have long held predominance in factories accounts for the establishment of green—a cool color—as a basic machine color. For assembly rooms and other places where women outnumber the men employees, yellow and various shades of light red are excellent colors for morale.

Green is the most restful of all colors, and, as a hue, it provides the least contrast with other hues.

Color in the Plant

COLOR DYNAMICS in the Huntington, W. Va., locomotive-repair shops of the C & O line started in the laboratory where purchased supplies and materials are tested. Colored paints entered the picture when they were undergoing refractometer and weather-resistance tests before being applied to locomotives, bridges, and rolling stock. With the objective of identifying electrical outlets, handwheels, instrument controls and the like with "see-able" colors, the lab staff added a little imagination and came up with a color system that was applied throughout the lab.

The lab is located on the third floor of the "lean-to" section of the shop building, just down the aisle from the manufacturing toolroom at the other end of the bay, so the colors quickly caught the eye of the toolroom foreman. He had his shop painted up with the same system, and the idea spread to the turret-lathe department between the toolroom and the lab, then all through the locomotive shop. This was no little job, for it took three months at 16 hours a day to complete.

But the results were worth the effort because the system is consistent throughout all departments and

***Color scheme** applied in the C & O Huntington repair shops went through its early stages in this manufacturing toolroom, after the testing-lab staff on the same floor tried experimental colors on its equipment. Lab staff checks colors for standardization*

identifies any machine part or piece of equipment to any of the personnel by means of standard colors, which were checked in the lab. Essentially, the system is based on the "Color Dynamics" recommendations of the Pittsburgh Plate Glass Co.

Some unusual features have cropped up as indirect results of the system, but which complement the color coding and increase its value. Mercury-vapor lamps were installed throughout the shop to show up the colors in their true values. However, to avoid dangerous losses of light when the lamps blink out (this happens often in the summer, and it takes up to five minutes for a hot lamp to get going again) the mercury-vapor lamps were alternated in the ceiling layout with standard Mazda lamps. The result is that a sure source of light is available at all times, and a near-sunlight source is working practically all of the time. Light intensity is 22 ft-candles in the working area, 50-ft candles in the toolroom, where lighting is from four fluorescent troughs.

Many non-standard applications of color have proved valuable. Steel stairways to upper floors are painted in red except for a horizontal yellow band on the front face of each step. This allows high visibility in a location that is not easily scuffed and which does not get dirty in a hurry.

Foremen's names are lettered on their green-painted desks in each department, leaving no doubt as to who belongs to which desk. Tool numbers are painted on the tile-red racks where they can't be missed—on the inside of separation panels, near the front of the rack. Yellow strips around bench and table tops draw attention to accident hazards.

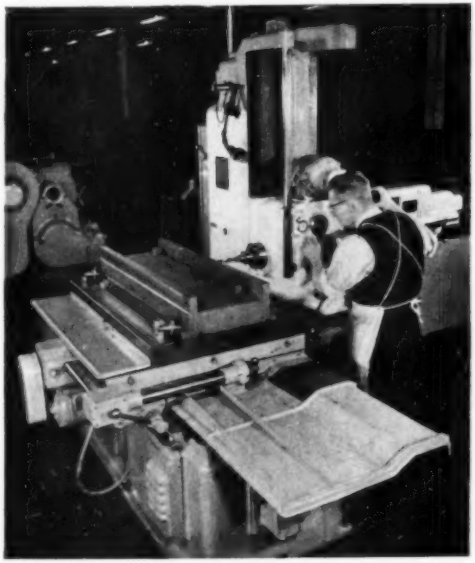
The powerhouse is painted in white and two shades of light blue on walls and ceiling, but otherwise identification colors of controls, lines and equipment are carried out in the same code as in the main shops.

Press Shop Tries Color

At V & O Press, not only is the shop painted in colors that promote unusually good housekeeping, but the products are also painted. Throats of punch presses are surfaced with yellow to provide more light inside the dies and to discourage carelessness about leaving grease and dirt after a tear-down.

Walls and ceilings in the plant are light green; dados (lower walls) are medium green; control boxes, switches, and cranes are orange. The conventional red indicates fire-fighting equipment in bands around building pillars. Quenching tanks in the heat-treat room are gray.

A special effect was noticed in a low-ceiling room that houses experimental equipment when the alu-



***High visibility** of yellow is employed by du Pont on moving edges of toolroom miller. This stands out against basic gray and blue on larger machine surfaces and guards*

***Toolroom** in Santa Barbara College (University of California) shop trains teachers in machine-shop practice. Color scheme was applied by advanced students after studying lighting, machine location, and effect of color on production and management*

minum color was changed to a light green on upper walls and ceiling. It seemed to the men that the ceiling had been raised about 2 ft., and that there was about 50% more room in the limited space. This was due to the receding effect of the green color.

Worcester Pressed Steel tried white (for improved reflectance) on its presses, trucks, lathes, and other large equipment, but changed over to yellow with a little red mixed in to foster alertness. The original white became too easily stained with oil. Blue spots electrical boxes and high-voltage junctions. Green is featured in locker rooms and stretcher boxes; cream in the first-aid room. This particular system was applied a little at a time, with a good deal of experimenting involved.

A similar system is employed in New York City's subway-maintenance shops where orange indicates extreme danger at saws, shears, and hoists—and yellow spotlights lesser dangers—rails around pits, crane cabs, warning signs and the like. Yellow is hatched with black to indicate bumping blocks, and white bands around the bottom of building pillars keep the mechanics from damaging rolling equipment and themselves.

COLORS AT C & O REPAIR SHOPS

APPLICATION	COLOR
Ceiling	Blue White
Walls	Light Blue
Dado	Light Gray
End walls (east and west ends of the building)	Sun-tan Yellow
Machine bases	Green
Operating parts (Flywheels, slides)	Ivory
Handwheels, levers	Yellow
Switch boxes, control boxes	Orange
Tool bins, racks, vises	Tile Red
Cranes	Yellow
Trucks	Maroon
Fire-fighting equipment	Red
Gas lines	Red
Air lines	Black
Steam lines	Buff

Basic green is applied to non-moving machine parts with bright colors showing up rotating and reciprocating members and controls in large locomotive-repair plant

Model School Shop Starts with Color

Purdue University's renovated machine shop is painted in colors that reflect a compromise of the many conflicting commercial color schemes. Basic color of the machines is the light gray recommended by the National Machine Tool Builders' Association —considerably lighter than the old machine-tool gray—yet not too bright to keep clean.

Ceilings are light green, walls slightly darker green, and dados still darker green. Color codes follow the usual red for fire-fighting equipment, green crosses for first-aid equipment, and yellow striped with black for hazardous places. Yellow traffic markers restrict movement in unusually dangerous areas, and outline floor areas where workers perform dangerous jobs, like operating shears.

Lathe chip pans are bordered in red to warn students not to pick up hot chips. Round blue signs with yellow lettering warn students away from machinery being repaired. White stars or spots locate

waste cans and white corners on stair landings discourage the accumulation of refuse.

The main electrical panel for the shop is striped along the bottom ends with orange, and an orange circle around a blue circle above the panel marks its location so it can be found quickly in case of emergency. All electrical outlets are blue and are stenciled with the voltage and phase available for easy reference.

Navy Standardizes Installation Colors

"The Application of Color to Shore Establishments," a handbook just released by the U S Navy Department, outlines a uniform color practice for "better and more economical maintenance" of Naval installations.

Interior colors for Navy repair docks, machine shops, and shore establishments are based on three general plans:

1. White overhead, light green upper walls, and deep green dados and trim.
2. White overhead, light green upper walls, and medium green dados and trim.
3. White overhead, soft yellow upper walls, and medium tan dados and trim.

The first plan is recommended for general shops, where personnel are concentrated, and for any climates except those that are usually cold. The second plan is for shops where housekeeping is critical, and where operations are fine and precise. The third plan is for cool locations, where light may be poor, and where the warm effects of yellow are an advantage.

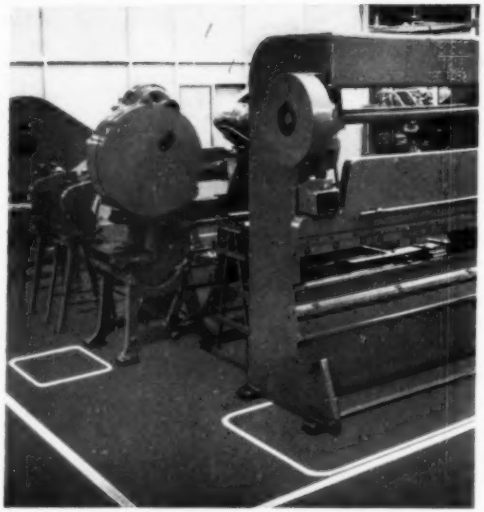
Navy coding is similar to many other systems. Black and yellow stripes are used on moving equipment, red codes fire equipment, green marks first-aid devices, and blue denotes electrical controls. The basic machine color is a standard gray, with orange painted on switches, knife guards, exposed hazards like powered rails, and the inside faces of control panels.

General housekeeping in the Navy is provided for with white and gray. White corners, white squares under and around waste cans, white drinking fountains, and white aisle stripes improve maintenance. Gray marks waste cans, storage bins, and general equipment.

Results of Planning

The effect of color on production is difficult to measure. Few, if any, plants have before-and-after figures that can point the finger directly at color as the cause for increased production.

A report from Jones & Laughlin's Gilmore Wire Rope plant indicates that twisting-machine efficiency increased from 86% to 96% in three years—"—largely from the beneficial effects of pleasant colors." Lost time from accidents dropped 38% in six months after the new color job was completed, labor turnover dropped from 4.5 to under 0.4%, and absenteeism dropped from 5% to less than 2%.



***Aisle markers** in Purdue University's production-processes shop are wide white strips. Narrower bands are yellow rectangles painted under and in front of machines to spotlight work areas. These tend to keep workers out of dangerous areas behind machines by showing the only proper locations from which machines can be operated*

The Meanings of Colors

THEORETICALLY there is no limit to the number of possible colors. About 100 million can be separated by photoelectric tri-stimulus colorimetry, and over 17,000 can be detected by an unaided human eye. This includes 250 basic spectral colors, about 10,000 tints, and 7,000 additional colors like purple, which is not a spectral color.

Likewise the number of possible combinations for color schemes is unlimited—in theory at least. Actually, effective use of color as an indicator—a functional tool—depends upon its general recognition for what it is supposed to represent. If slanted stripes of yellow and black—the most highly visible color combination of all—is to represent danger, the stripes must be bright yellow and blackest black so their meaning will be clear.

Our feelings about colors come from centuries of history. Tradition and legend reiterate the parallel between red and fire, black and death, green and coolness. When you think about colors and their associations, consider these things:

RED

Symbolism: Egyptians considered it the hue of their race, developed cosmetics to emphasize it; we still use 'em. Greeks thought it the color of love, related

it to fire, wore it in acting the Iliad. Romans related it to the planet Mars. Chinese called it the color of the South, used it on temple walls to represent the sun and happiness. It became the most prominent of colors in Japanese mythology. Christians used it to signify sacrifice and sin, so martyrs wore it to indicate their willingness to sacrifice themselves to cleanse their souls of sin. Red was the color of the Holy Ghost, of hell and of the body of man. Both Jewish and Catholic rites still recognize it as a sacred hue.

In heraldry, red, called *gules*, meant courage and zeal. In India it symbolized the warriors in the original four castes. As a talisman, it protected against disease, fire, and lightning. English physicians wore it as a mark of their profession, but now it denotes theology. Newton assigned red to note C of the diatonic scale.

Associations: Danger, fire. Sometimes irritating. In tones of rose, preferred by women, hence suitable in women's facilities.

BLUE

Symbolism: Sky color, preferred among all peoples. Egyptians considered it divine, used it on temple ceilings. Greeks assigned blue to the element air, wore it as a symbol of honesty and integrity. Romans gave it to the planet Mercury. The Hindu thought it the true color of the sun; the Druid, the symbol of harmony and truth. In the Bible, the throne of the Lord is described as sapphire, as were the tablets received by Moses on Mount Sinai. In Christian symbolism, blue stood for hope and piety, was called the hue of God the Father, heaven, and the spirit of man. Blue is part of the modern Jewish rite.

In heraldry, blue, called *azure*, meant holiness and sincerity. As a talisman, it safeguarded and preserved the body, was considered the spiritual phase of the human aura. It is now the color of philosophy as a branch of learning. Newton assigned it note G of the diatonic scale.

Associations: Calmness, remoteness. Sometimes depressing. Preferred color of men, hence good in their facilities, work, costumes, etc.

GREEN

Symbolism: Represented nature, fecundity, everlasting life, so ancients related it to the element water and to the planet Venus. Egyptians used it on temple floors, to represent Nile meadows and made it sacred to the god Osiris. The Chinese made it the hue of the East and the color of the Ming dynasty. English druids wore it as a token of learning, Mohammedans considered it as the color of the World Mother, wore it on their turbans if they had made the pilgrimage to Mecca. Early Christians thought it signified faith and immortality, used it on the robes of saints. It was the hue of the Holy Grail and is recognized in the modern Catholic rite.

In heraldry, green, called *vert*, stood for youth and hope. As an amulet, it assured fertility in man and beast, was thought to show altruism and charity in the human aura. In modern times, it represents the art of medicine. Newton assigned it to note F of the diatonic scale.

Associations: Nature, refreshing, safety. Gives feeling of coolness to uncomfortably warm areas.

YELLOW

Symbolism: identified with the sun, and by the ancients with air. Chinese considered it the color of earth, used it on temple roofs, considered it sacred to Confucius. It was sacred also to Athena, Brahma and Buddha, was the divine color of marriage to the Hindu, and early Hebrew. Ezekiel likened God to the color of amber. Christians made it stand for power and glory, used it for saints' halos, identified it with Jesus, earth, and the mind of man.

In heraldry, yellow, called *or*, meant honor and loyalty. In the original four castes of India, it marked merchants and tradesmen. As a talisman it brought happiness and prosperity, thwarted the plague. In the human aura it was identified with the intellectual, now represents science as a branch of learning. Newton assigned yellow to note E of the diatonic scale.

Associations: Sun, warmth, stimulation. Rare negative association with cowardice. With black it is the most visible color.

PURPLE

Symbolism: Hue of earth to Egyptians. Greeks wore it to represent sea wanderings of Ulysses in acting the Odyssey. Rome made it the imperial color, so Caesar wore it when personifying Jupiter. Represented splendor and dignity in the Jewish rite, suffering and endurance to the early Christian. Christ was said to have worn purple at the Crucifixion, so the color is common in rosaries and is associated with Easter.

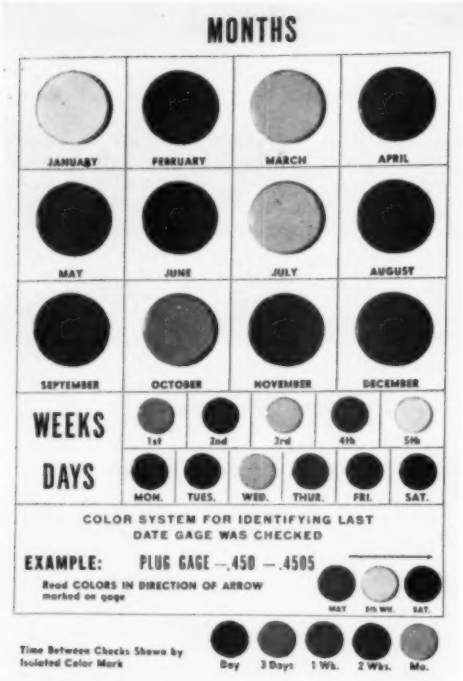
In heraldry, *purpure* was for royalty and rank, and a red-purple, *murrey*, siginfied courageous sacrifice. As an amulet, it was thought to safeguard a warrior; in the human aura, to signify the ideal and sublime spirit. Now denotes law as a branch of human learning. Newton related violet to note B of the diatonic scale, indigo to note A.

Associations: Royalty, luxury, richness, formality, winner over all classes. While considered a cool color, reddish tones are definitely warm.

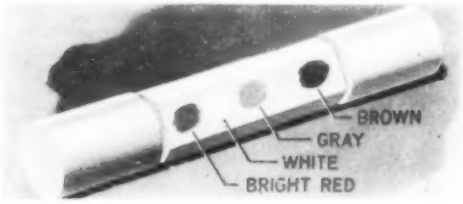
ORANGE

Symbolism: This hue does not have the historical symbolism of the other five colors in the color "wheel," principally because it was not recognized as a separate color until the Middle Ages. It now symbolizes autumn, with rich harvests, plenty, abundance and completeness of life. As it is the closest approach to flame color, it also symbolizes light and heat. Artists consider it to mean progress; in the educational world it is considered to be the hue of engineering.

Associations: Well-being, warmth, cheer. An emotional stimulant. Helps to relieve coolness or drabness of blue. Used to give warmth to dark or dull areas, such as inside stairways.



***This chart** hangs in W. H. Nichols' gage laboratory where pickup men can check gage colors against dates for recalibration. Colored disks retain their hues permanently —act as standard for disk-spotting paints*



***Three spots** on plug gage indicate last date of check, isolated spot indicates frequency of checks by gage lab*

CODES FOR PIPELINES

APPLICATION	COLOR
Steam	Orange
Gases	Yellow
Water	Green
Solvents	Blue
Electrical conduit	Black
Process materials	Gray
Extra-valuable materials	Purple

Pipelines at Du Pont follow a standard code, depending upon the materials they convey.

Coding with Color

THE FIELD of color coding is one that has been barely explored, although it offers the most easily demonstrable results. A good code identifies a physical, chemical, or other important property of parts or equipment that is either not otherwise obvious or that can be more readily shown by color. One company makes it easy for workers to select the correct sizes of washers, gaskets, and rivets for assembly by daubing color spots on the parts. When a given size is required, a worker just reaches into a box of parts of assorted sizes and picks out a green one, or red one, or blue one.

Codes can be applied in any number of spots, and need not interfere with either safety systems or the wall and floor colors of the plants. Normally such code marks are small—spots, stripes, or painted surfaces—and when they are on parts or products they are often confined in tote pans or baskets.

A simple color code (independent of the interior color scheme of the plant) used at Libby-Owens-Ford glass plants has only two elements. Fire-red circles 18 inches in diameter are painted high above fire-control equipment to clear tall stacks of glass. White arrows leading from the circles point directly (usually straight down) to the equipment. Moving objects which present physical hazards to personnel (lift hooks, trucks, conveyor baskets) are striped with a high-visibility yellow. Truck-traffic lanes are bordered with 6-in. yellow bands, and doors leading to dangerous areas are cross-hatched with yellow. Control switches, handles, and parts of machines are also colored yellow. Such a code leaves little doubt in the mind of any employee as to what the colors mean.

Gages Coded for Check Periods

Plug and ring gages at W. H. Nichols Company are coded with four color spots on bare spots or open spots on the shanks. Because gages must be checked constantly to insure accuracy, a recheck schedule is integrated with the code to indicate when a gage should be picked up and returned to the lab.

Three spots close together indicate the date of the last check by month, week, and day. An isolated spot—in the same row but down the shank a bit—denotes the frequency of checking in terms of five basic cycles. Lab personnel do their own pickup and replacement work, so nobody else has to learn the code. After checking, the paint is removed and three new spots are daubed on.

This system is based on a similar method employed at General Electric. The code at G.E. is worked in with a Cardex inventory of all gages in the shops. One file contains cards for each gage grouped by future inspection date, so all gages due for a recheck on that day are picked up and checked against the file. Another file lists all gages by type and frequency of checking.

G.E. gages are marked with spots of different size —a large spot for the month, smaller one for the

week, and the smallest one for the day. Gages in the gage lab and not in service are not coded but are rechecked before being placed back in service.

Assembly Parts Chosen with Code

Successive assembly operations on a small Eastman Kodak camera are *not* performed next to each other in a conventional sequence, even though a closed-circuit conveyor is used. The carriers move trays of parts and subassemblies through all of the departments necessary for the complete jobs, and operators identify the parts by color.

Horizontal stripes are painted on the carriers, and one operator lifts a light aluminum tray of parts from a red carrier and performs the necessary operations. Loaded after processing into another tray, the parts are placed on a carrier coded green, which is picked up by the next operator who may be many yards away. All necessary parts are loaded into trays and on coded carriers in the stock room, and no tray is lost if an operator misses it—it comes around the circuit some time later.

The color-code system permits locating such operations as soldering and punching in places away from light assembly operations. As long as the equipment required for one operator is not too heavy, that operation can be moved to any convenient place around the circuit to get around personality conflicts, mechanical hazards, and location troubles of any kind.

Spring Selection by Color Code

A customer indirectly made Hunter Spring Company color-conscious when Hunter licked selective-assembly problems involved in a spring-loading job. Neither springs nor parts were the exact strength or weight nominally indicated, so the springs were dyed red, green, or blue to indicate that they were weak, medium, or strong; and the parts were colored in the same order to indicate low, medium, or high weight. Assembly defects dropped from 41% to less than 1% when the colors were matched up at the assembly bench.

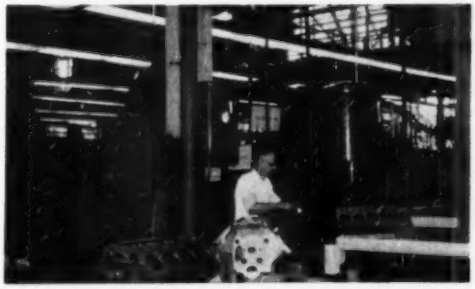
Hunter projected this traffic-light system back to its own plant where small sorting pans are now enameled in the three colors to identify springs at final inspection. Large tote pans, into which the sorting pans are emptied, are identified by 3x4-in. painted metal tags in the same colors.

Maintenance with Color

ASIDE FROM increased production and improved efficiency, maintenance requirements are reduced by the simple virtues of color and brightness. Workers will naturally take more care in cleaning grease and chips from machines and floors that are painted in colors that show up the dirt.

The greatest clean-up effect can be obtained with white paint. A spot of white on floor under a waste can and on the wall behind it identifies and targets

***Oxyacetylene flames** harden tractor grousers with gas leads coded in colors. Red indicates acetylene, green identifies oxygen, and other colors stand for air, water and extra oxygen when it is necessary for special jobs*



***Flammable materials** in Oldsmobile's Rocket-engine plant are confined in red-painted containers. Blue shows up electrical panels, and dark green identifies tanks for special, extra-valuable, liquid materials*

the receptacle. Although the worker may toss a piece of waste *at* a can surrounded by gray or the standard, dull floor and wall colors, he will usually make sure that the same bit of waste gets *in* a can surrounded by bands or spots of white. The glaring contrast between clean white paint and grease or dirt is usually just too much for the average person's sense of neatness.

Light colors, by virtue of their lightness and not by the specific colors, have the same effect throughout the shop. Dirt, grease, oil and smudges on walls, floors and structures show up like black eyes when they are thrown in contrast to the background by light colors.

However, if the painted background is allowed to get dusty and dirty over a long period of time, its effect will become no more pronounced than that of

***Bad lighting** is still typical of many plants. Here color application is useless until the workers can see colors with something near daylight brilliance*

General Electric

***Good lighting,** at United Air Lines' San Francisco maintenance base, clears the way for functional and aesthetic color meanings—and higher worker productivity*

a black cat on a dark night. The background must be clean of *primary* dirt—that deposited by the air on any exposed surface, to be an effective deterrent to *secondary* dirt—that normally deposited by the carelessness and neglect of the workers.

Power failures and fires at night present problems in which light is of primary importance and color is secondary. In such cases emergency equipment must be immediately available and the shop must be safe for personnel walking through, even if there are no lights. Luminescent paints and tapes are two solutions to the problem of illumination when no immediate source of light is available.

Stairways, aisles, doorways and projecting and dangerous parts on machines and physical equipment can be indicated by painted strips and spots or by strips of tape. Fuse boxes, switchboxes, fire-alarm boxes, medicine cabinets and other equipment on walls or pillars can be located easily if they are outlined on paint or tape, or if panels back of them are painted to silhouette them to persons standing near.

Accident Prevention

Fluorescent paints, although more useful in interior decorating, have the advantage of producing bright colors through a wide range of the spectrum. They must be activated by a low-power black-light source, which would have to be independent of the regular power lines. Phosphorescent paints, which glow after the light source (daylight or electric lights) has been removed, have a limited color range, but can still produce colors for identification. Fire equipment can be painted with red, first-aid with green, and other colors can be applied to other equipment like doorknobs and stair rails.

Another use to which color can be put is one that has long been recognized—as a simple application of paint. Windows through which operators have to face low morning or afternoon sunshine can be painted up to a level to protect vision or special tinted glass can be installed. The color here should be green or another restful, cool color.

Maintenance of Paint

A CRITICAL POINT in the application of color in a shop is the length of time a pigment can maintain its brightness and hue against oxidation, dirt, and grease. Paints of light hues lose brightness faster than those of darker hues, and they seem to fall behind even faster than they actually do because of the rapid loss of psychological impact as they get dull. Pigments for a shop should be chosen from paints that will not lose much of their brightness over a year, or whatever a reasonable period of maintenance might be.

We acknowledge . . .

The generous cooperation of the following companies and organizations which have assisted and contributed material for this report:

Air Reduction Sales Company
The Arco Company
Devoe & Raynolds Company, Inc.
Eastman Kodak Company
E. I. duPont de Nemours & Co.
General Electric Company
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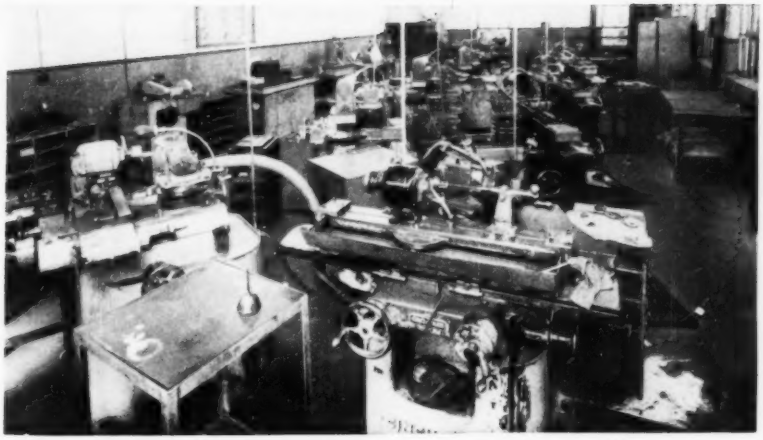
Libbey-Owens-Ford Glass Co.
New York City Board of Transportation
W. H. Nichols Company
Pittsburgh Plate Glass Co.
Purdue University
Santa Barbara College, University of California
Sherwin-Williams Company
The V & O Press Company
Westinghouse Electric Corp.
Worcester Pressed Steel Co.



Before: Flute grinding room was a congested mass of machines, and aisle space was practically non-existent

After: Flute grinding room is uncrowded even though four new automatic flute grinders were added to the equipment in this room

Color and Layout Breed Efficiency

Staples Tool Co. is revising plant layout, using new lighting and color, with results that please both management and employees, give a bonus of more space

EFFICIENCY went with improved appearance when The Staples Tool Co., Cincinnati, Ohio, replanned its shop layout. Production from the same men and equipment is already up 15% in the first department affected.

The plant is located in an old building with the seven operating departments split up into as many rooms. As business grew, the new machines had been installed more or less at random where space could be found. Both machinery and walls were painted gray throughout the plant.

Cables for each machine were carried down from the ceiling in conduit. The first step was to relocate machines so that conduit

could come down the walls and under floors to the machine. This cleared the atmosphere considerably.

Machines were painted green and walls cream with a green dado. Fluorescent lighting was installed as each room was done over.

Production Uninterrupted by Change

The transition was made slowly, with no interruption to production. Veterans who wished to take additional schooling before returning to the plant did most of the work at night and on weekends. This has made the transition, still in progress, slower than it would otherwise have been, but helped these men finance their schooling and met with general approval even though each foreman has been anxious to get his department done as soon as possible.

Results have exceeded expectations. In the cutter grinding room, it had been necessary to keep two men on a night shift to take care of rush jobs. Efficiency is so much improved by the change that these men have been moved to the day shift and the cutter room has even been able to lend men to other departments to help them deal with emergency orders.

The changes that have been made have not only added to operating efficiency. There has been a noticeable effect on employee morale. Without any urging, the plant is kept much cleaner and neater. For example, trash which used to go on the floor is now put in cans. Men in the plant started doing this of their own volition without any urging or educational program by the management.

← **Before:** Cutter room had machines at random, had to work men at night to keep up with rush work

After: Cutter room has an added optical comparator but still has more space than before. The extra shift is ↓ no longer needed

***Production Lab** . . Contrast these machine types with basic units shown on next page. Note materials-handling units. Yellow with black is used as a warning color, the new machine-tool gray for machines and tones of green for walls. Floor stripes separate departments*

Purdue Rebuilds Machine-Tool Laboratory

BY O. D. LASCOE, ASSOCIATE PROFESSOR, MANUFACTURING PROCESSES

"The future engineer must be able to think, create, and produce," says Dean A. A. Potter of Purdue. To achieve that end, a $2 million machine-tool laboratory features production setups, color, latest equipment and arrangement, modern storage and handling devices

SEVERAL years ago, Purdue University had an average machine shop hidden away in a dark corner of the Michael Golden Engineering building. The engineering students knew where "Mike's Castle" was; they took a shop course which drew them to this grotesque nightmare of overhead lineshafts, slapping belts and antiquated machine tools. Potential engineers operated old engine lathes, shapers, and drillpresses, along with a few outmoded turret lathes. Graduating engineers of that time assimilated only the "priceless gems" of machine-shop knowledge known to their grandfathers several decades back.

This old shop setup did little to enhance one of the largest engineering schools because the gap between modern industrial practices and this obsolete environment was far too great; by not keeping abreast of progress, practical instruction concerning machine tools and related subjects was in danger of becoming a dying ember of a once-blazing portion of the engineer's curriculum. In many instances students were offered only a lecture movie course which at best was an extremely poor substitute for first-hand association with names, nomenclature, and application of various machine tools.

Fortunately, this was not allowed to occur. The Purdue engineer will soon be introduced to the outside engineering world, not through a memento of bygone machine-shop practice but through a new ultra-modern machine-tool laboratory which is unequaled by any university machine shop the world over.

The Electrical Engineer will have the opportunity to observe transmission and application of electrical energy for power and lighting. The Mechanical Engineer will have a chance to study the most recent

***Production Processes** . . Stamping and forming, grinding, screw machines and turret lathes, gearing, milling and hobbing, profiling and duplicating are machine groups shown. Inspection and assembly areas, a precision-instrument room, tool crib, etc., are also provided*

THESE MANUFACTURERS ARE REPRESENTED IN THIS 15,500-SQ FT MACHINE-TOOL LABORATORY

Basic Concepts

Engine Lathes — Monarch, LeBlond, Hendey, American

Millers—Cincinnati, Kearney & Trecker, Brown & Sharpe, Van Norman, Sheldon, Nichols, Burke, Kent-Owens

Shaping, Drilling, Etc.—Smith & Mills, Snow, Atlas, Ammco, DoAll, Cinci, Bickford, Edlund, Shape-Rite, Grob, Oliver, Delta, Walker-Turner, G.&E.

Production Processes

Stamping & Forming—Bliss, Toledo, L. & J., Verson, White, Logan, K. R. Wilson, Elmes, Whitney-Jensen, Perkins

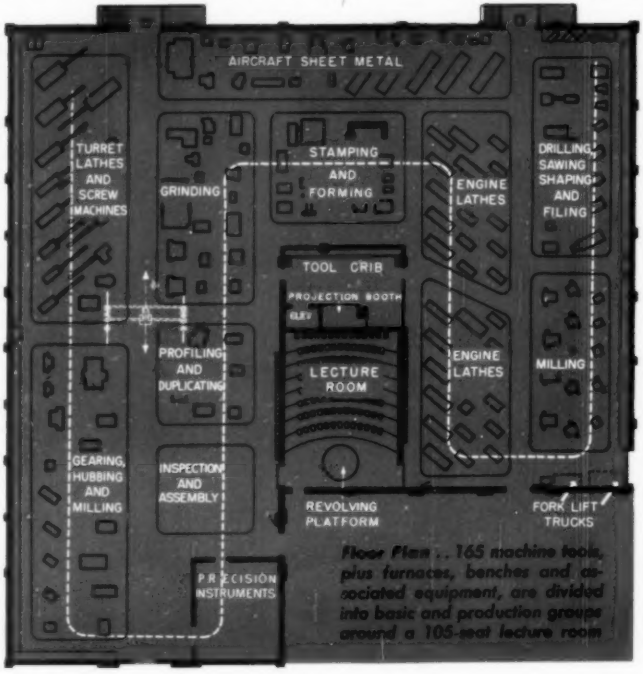
Grinding — Cincinnati, Landis, Heald, Taft-Pierce, Hanchett, DoAll, Norton, Brown & Sharpe, Porter-Cable, Rivett, Hammond, Boyar-Schultz, Sunnen, Grand Rapids, Oliver

Screw Machines & Turret Lathes—Gisholt, Brown & Sharpe, Wickman, Rogers, Heald, Simmons, Hardinge, Rivett, Warner & Swasey

Gearing, Milling, Hobbing — Barber-Colman, Fellows, Gleason, Pratt & Whitney, Cincinnati Milling, Milwaukee, Kent-Owens, Brown & Sharpe

Profiling & Duplicating—LeBlond, Cincinnati Milling, DoAll, American, Bridgeport, Gorton, Knight

Aircraft Sheet Metal — Cincinnati Shaper, Onsrud, Erco, Campbell, Walker-Turner, Edlund, Delta, Northill, Federal, DoAll, Knight, Pexto, Chicago Pneumatic, Wiedemann, Lindberg



***Floor Plan** . . 165 machine tools, plus furnaces, benches and associated equipment, are divided into basic and production groups around a 105-seat lecture room*

***Profiling & Duplicating** . . These relatively new processes are shown by machines from five manufacturers. Research on sawing and turning will be conducted here*

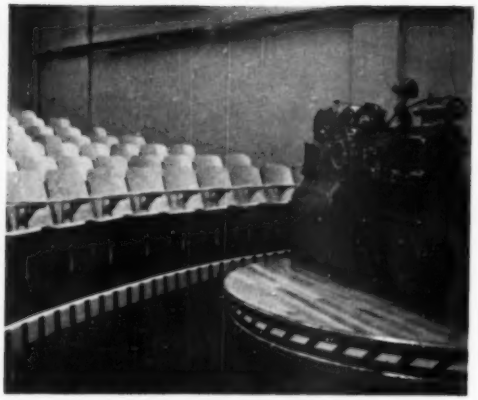
design and placing of controls on machine tools. The Metallurgical Engineer will be able to see first hand the effects of alloying elements on production cutting tools and metal-cutting processes. The Industrial Engineer will be able to apply methods, motion and time study to production and assembly work as well as to machine-tool operation. All will become more safety conscious because every engineer will come in contact with products which depend upon machine output.

At the end of World War II, a great number of war-surplus machine tools were acquired, ranging from the simplest to the most complex units, including some fully tooled. These have been reconditioned and installed in a completely rebuilt shop area, providing both basic training units and the production tools and services.

Today Purdue has a machine shop worth over two billion dollars. The laboratory is divided into two main divisions: (1) Basic Concepts in Metal Cutting, and (2) Production Processes. In the Basic

***Navy Gage Lab** . . High lighting level, temperature and humidity control are provided in this basement lab. Only one of the two rooms is shown. A smaller gage room upstairs handles preliminary training*

***Tool Storage** . . To stimulate creative thinking on tool inventory and record keeping, a model tool storage has been set up in the basement. It is connected by elevator with the tool crib*



Lecture Room.. Features here include safety colors, a 10-ft. revolving demonstration platform capable of supporting a 3-ton machine, projection equipment for slides or films, and similar appurtenances

Bar-stock Storage.. Safety colors are applied throughout this basement room. Special all-welded stock racks have been developed

Concepts, general-purpose machine tools are grouped into areas representing a family of machines so the prospective engineer may be familiar with basic cutting tools, techniques and motions essential to understand the phases of metal-cutting processes. Here a student will have a definite course of study to follow, consisting of the fundamentals of single-point cutting tools, the multiplicity of cutters applied to metal turning, milling, shaping, drilling, sawing, grinding and filing, along with the limitations and capacities of a variety of makes of machine tools. This will enhance in the mind of an engineer the ability to select and evaluate operations performed on basic machines. In order to grasp the principles of production processes, one must understand first the unit operations in fundamental machines.

In Production Processes the more complicated machines are grouped into several areas for the purpose of introducing the production capabilities and the science of tool engineering. Modern production methods demand thorough knowledge of stamping and forming performed by mechanical and hydraulic machinery. Die design and the applications of the newer alloying metals will stimulate further research in this field. Grinding practices will provide the embryo engineer with first-hand information regarding profile and form grinding, external and internal centerless grinding, cylindrical grinding, geometry of tool grinding, plain and rotary surface grinding, abrasive-belt grinding and honing and superfinishing.

The turret lathes and automatic screw machines will be much better understood with the basic operations of an engine lathe well in the mind of the learner. In this area the engineer will operate a wide variety of machine tools from second-operation turret lathes up to the fully automatic, and from simple to complicated tooling, demonstrating complexity of production design and quality control.

In production gearing, milling, hobbing, etc, a tremendous amount of engineering education can be developed. Introduction to bed-type milling machines will focus the student's attention upon the tool engineering applied to jigs and fixtures because the basic cutting actions have been applied in the basic areas on the knee-type mill. Gear hobbing, shaping, generating and shaving processes will certainly introduce the important methods of producing gears and will also emphasize the need for kinematic analysis to obtain the desired characteristics for different applications to spur, bevel, hypoid, and helical gearing.

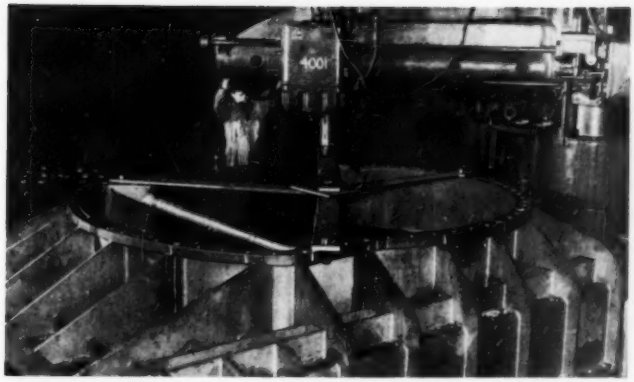
Profiling and duplicating actions have firmly established themselves as important processes in manufacturing. Complicated designs in dies and molds open avenues to high-speed production. Therefore, the engineer who doesn't understand the equipment capable of performing such operations will be totally lost in modern production.

In the inspection and assembly, modern gaging and inspection methods will develop respect for tolerances within one millionth of an inch. The assembly line will provide food for thought to the motion and time study engineer.

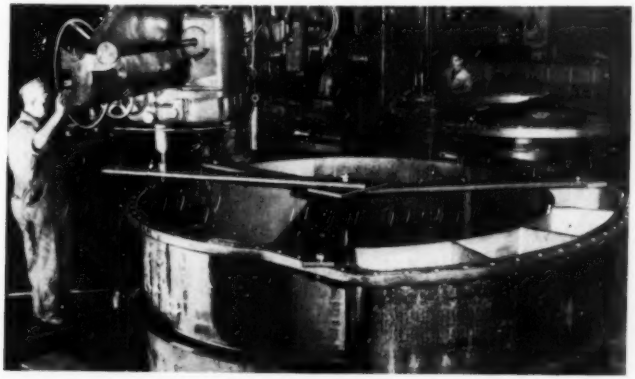
Extensive Changes

The entire shop area has been renovated, at a cost of something over a quarter-million dollars. Services are now supplied through a subfloor conduit network. Fluorescent lighting has been installed throughout and special colors applied to both building and equipment. A basic gage room is tied in to the shop with the monorail conveyor system, and industrial trucks are also available. A well-equipped tool crib is connected by elevator with the tool and material storage in the basement. The lecture amphitheater has a 10-ft. turntable capable of handling a 3-ton machine. In the basement are a maintenance machine shop for general use, a research section for special projects and a Navy gage laboratory, fully air-conditioned. All machines are mounted on engineered isolating pads to minimize vibration.

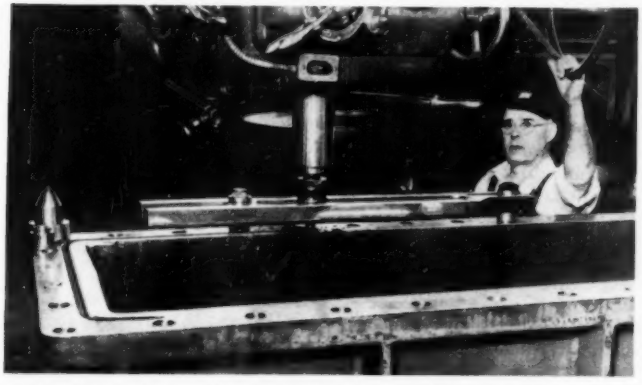
DAM DRILLS GUIDED BY SPIDER & CAM



Main-gate sections for Shasta Dam outlets were V-grooved for neoprene gaskets by a radial drill working a V-shaped cutter. Cuts with different radiuses were controlled by inserting head through holes spaced along swinging arm centered by removable spider bolted-down on casting



Conduit sections to connect with main-gate sections were V-grooved with similar spiders which allowed long radius cuts to be made with one sweeping stroke of the unclamped drill arm



Straight-line and connecting grooves in conduits and bonnets were cut with cam plates guiding the head. Varying depths of grooves were handled by sleeve adjustment of drilling head

OF ALL the tough machining problems posed by the huge size of 96-in. outlet gates for Shasta Dam, one of the most challenging was that of cutting small V-grooves, ¾ in. wide, on the faces of the conduit sections. Temperature variations expected inside the dam after its completion made it necessary to join the main gates to three connecting sections each by means of neoprene gaskets to seal the joints, and this meant that, for 14 gates, a total of 56 grooves had to be contoured for the gaskets.

Two major radiuses connected by straight sections, with two small radiuses on each flange, would have taken 48 manhours each by conventional machining methods. But a routing technique, developed by Col. C. J. Hall, consulting engineer; Manuel Aflague, shop superintendent; and G. W. Hilton, small machines foreman, solved the problem and permitted finishing each flange in six to eight manhours without tying up heavy and badly needed machinery.

Temporary locating spiders bolted to flanges centered swinging arms which were drilled to admit cutting heads. These controlled the cutters for radius cuts. Straight cam plates were bolted to the flanges to guide the cutters for straight cuts, and cams with minor radiuses were positioned for the joining cuts. These were turned over for joining cuts on the opposite sides of the flanges.

Two bonnet sections for each gate were cut in the same way. Production men at the Sunnyvale, Cal., Westinghouse plant estimate that at least 1000 manhours were saved by this method on the entire Shasta gate job.

Five abrasive belt operations rough and finish grind machined crank forgings for final polishing, buffing, and plating. Operations are performed on Type C6 Porter-Cable machines equipped with a 16-in. dia, 4-in. face contact roll. First operation uses a Devine medium-hard compress roll and a 50-grit Three-M-ite resin-bond abrasive belt at 5600 fpm. Production is 150 to 385 pieces per belt. With setup wheels average cost was 14c per piece for abrasive only. Total cost, including labor and belts, now averages about 7c for all five operations

Wooden workholder is used on second and third grinding operations to force workpiece against abrasive belt. First three operations rough finish entire contour of cranks, except threaded sections in the center. A Devine medium-hard compress roll is used on the second machine, while a full-glued ¼-in. sewn buff wheel built up to 4-in. face width is used on the third machine to form the contour. Operations 2 and 3 use 50-grit belts at 5600 fpm and average 350 to 385 pieces per belt. Machines are placed in line, and parts are transferred from bench to bench

ABRASIVE BELTS FINISH PARTS FASTER

Increased production and substantially lower costs result from abrasive belts for grinding and polishing bicycle parts

BY WILLIAM F. STOEFFHAAS,
Vice-President
ARNOLD, SCHWINN & CO.

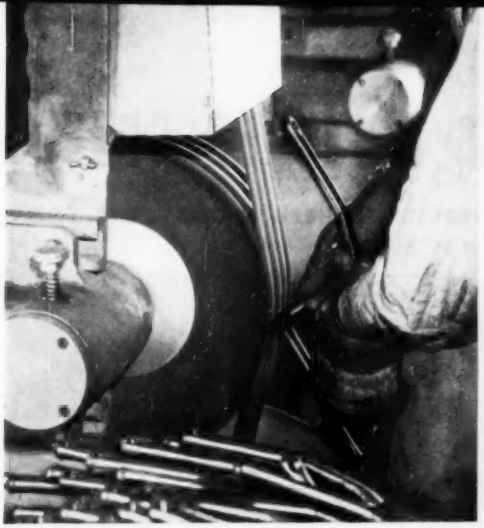
HIGH quality standards for bicycles made by Arnold, Schwinn & Co. are maintained by paying close attention to each manufacturing procedure used in the plant. Modern machining and welding equipment is used to make possible the production of precision parts at the lowest possible cost. And close attention to the proper performance of each operation is justified in terms of production requirements—more than 600,000 Schwinn bicycles of all types were produced in 1948.

Polishing, buffing, plating, painting and other finishing operations are studied as carefully as machining and welding operations. For this reason, the use of abrasive belts in place of setup grinding and polishing wheels for many of the parts finishing operations was investigated. The result was a considerable increase in the use of abrasive belts, with an accompanying decrease in finishing costs.

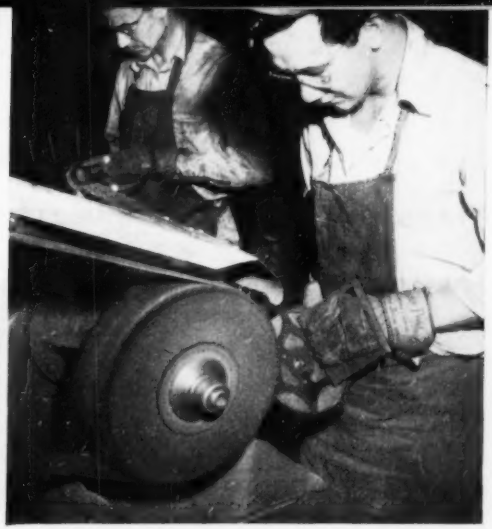
Both standard belt grinding machines, and polishing lathes equipped with backstand pulleys are used. In each case, the contact wheel or roll is selected carefully so it will have the proper density to give maximum grinding speed and belt life. Some of the operations which have been converted from setup wheel grinding to abrasive belt grinding are shown. For most of these, Three-M-ite resin-bond aluminum oxide abrasive belts are used, with grit sizes suited for the individual operations.

In addition to the savings made possible by the more efficient cutting action of abrasive belts, as compared with setup wheels, the use of belts makes possible another important economy. This is the considerable reduction in the cost of preparing the setup wheels for use. Only a few setup wheels are now necessary for final polishing operations instead of the large number which otherwise would have to be prepared each day. Moreover, finishes produced with abrasive belts are more consistent than those obtained with variable-quality setup wheels, and contoured surfaces are finished more economically.

An outstanding example of the economies made possible by abrasive belts is found in the cylindrical grinding of steel tubes for truss and frame members. These tubes are 24 to 36 in. long, and range from ⅜ to 1 in. O.D. They are centerless ground in a Production Type 101 grinder originally designed for setup wheels. This machine was converted to use abrasive belts by mounting a 16-in.



Porter-Cable Type C6 belt grinders equipped with Three-M-ite resin-bond belts are used for the fourth and fifth grinding operations. These two finish-grinding operations use full-glued 16-in. dia, 4-in. face, sewn buff wheels with faces contoured with three radiused grooves, as shown, to permit easy polishing of surface contours. Belt is 120 grit and is used at 5600 fpm. Belt life averages 225 pieces and it requires only two to three minutes to change belts



Bicycle sprockets are ground in two operations before polishing and plating. First grind, above, is performed at a Standard polishing lathe converted from setup wheels to abrasive belts by mounting Porter-Cable backstands on the wall behind the lathe. Contact wheels are 14-in. dia, 4-in. face, full glued, and operate at 2200 rpm. Belt speed is 8063 fpm. Three-M-ite 60-grit resin-bond cloth belts are used

Inside surfaces on fork welds are ground and polished with 24-grit Wetordry Tri-M-ite silicon carbide cloth belts 1½ in. wide operated at 5600 fpm in this Porter-Cable vertical belt machine. Production averages 50 to 55 forks per hr and belt life is approximately 200 pieces

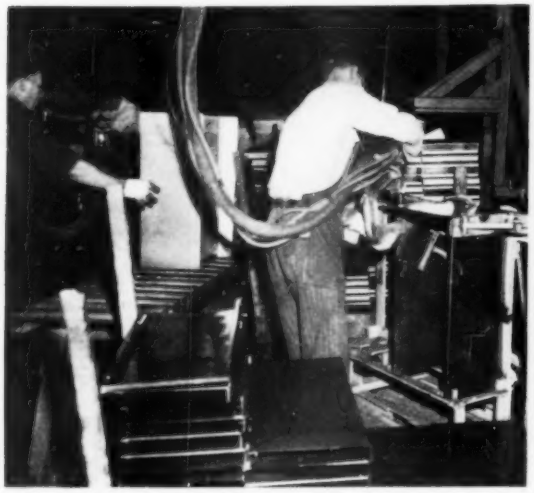
Weld flash on frame joints is ground on L'Hommedieu No. 20-A lathes equipped with Hammond No. 4 backstands and 16x1½-in. Presto rubber contact wheels. Belts are 50-grit Three-M-ite resin bond and production is 150 pieces per hr at 9215 fpm. Note castered floor stands used for moving frame sections to and from this operation. Belt life is approximately, 200 pieces

dia, 4-in. face K-type Minnesota Mining & Mfg. Co. contact roll of proper density in place of the setup wheel, and mounting a wall model Porter-Cable backstand in line with this roll.

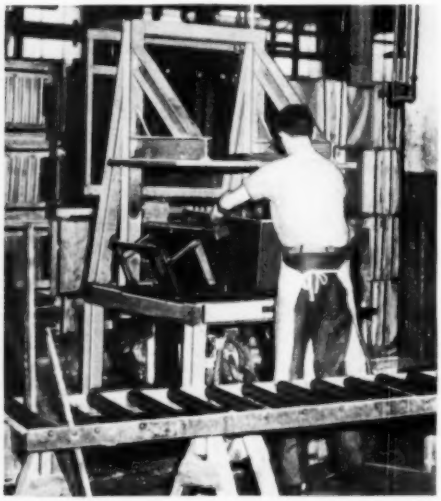
These steel tubes are now finished to the required surface condition in about one-half the time previously required for one of the three necessary setup wheel operations, and only one belt grinding operation is necessary. Approximately 1200 pieces are finished per belt. For this operation, it was necessary to prepare 9 to 12 setup wheels a day for each centerless grinding machine. Instead of the high-cost job of preparing setup wheels, the operator now needs only a few minutes to change belts.

WELDING FIXTURES SPEED

TEAMWORK AND QUICK-ACTING FIXTURES COMBINE WITH GAS AND GUN

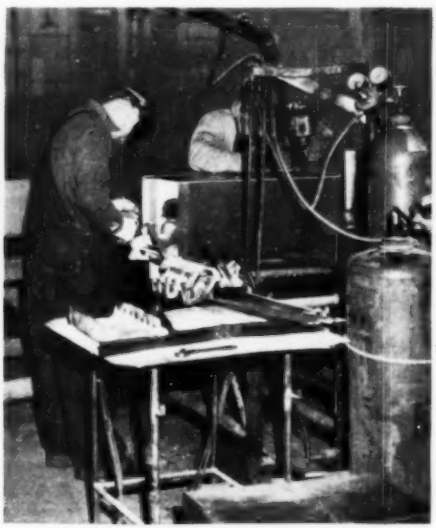


Operators on both sides of a roller conveyor assemble top and side panels of kitchen wall cabinets in framing fixtures equipped with positive stops and quick-acting clamps. Parts are tacked with swivel-tip welding guns and returned to conveyor



Expansion welding fixtures are employed for attaching the cabinet back panel to the top and side assembly. Fixtures are air operated and joints are resistance welded on both edges

Third operation is to weld the bottom panel to the assembly on trunnion fixtures, using gun welding equipment. Previously formed bottoms are delivered to this station on hand trucks from the press department in another part of the plant

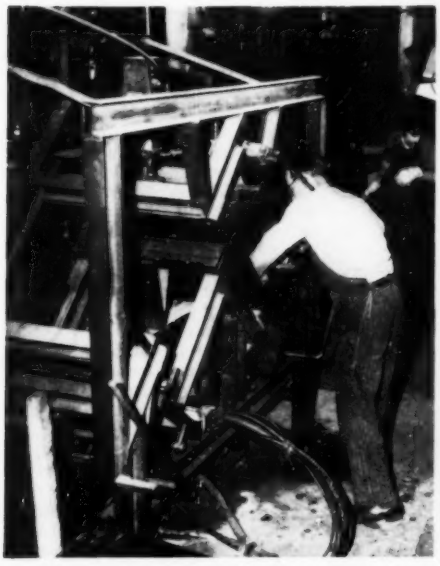


Two operators work simultaneously on final assembly. One brazes the bottom to the sides and the other gun-welds several spots where the top meets the back panel of the cabinet

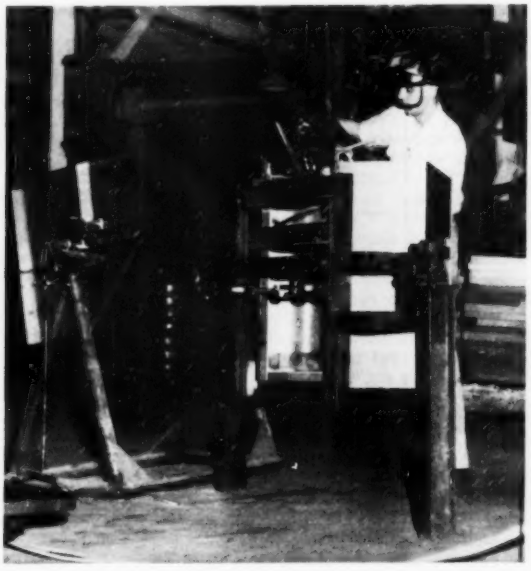
STEEL CABINET ASSEMBLY

BY WALTER RUDOLPH

WELDING TO BOOST OUTPUT AT AMERICAN CENTRAL DIV., AVCO MFG. CORP.



Special expansion welding machine holds two back panels, two side panels and a back corner post for corner cabinets while 20 welds are made with a gun welder. Clamping arms are air operated



Trunnion-type framing and squaring fixtures assemble bottom and front post subassemblies to the cabinet. Gas and resistance welding are used, the former for strengthening corner joints. Finished parts are then smoothed, cleaned, and painted

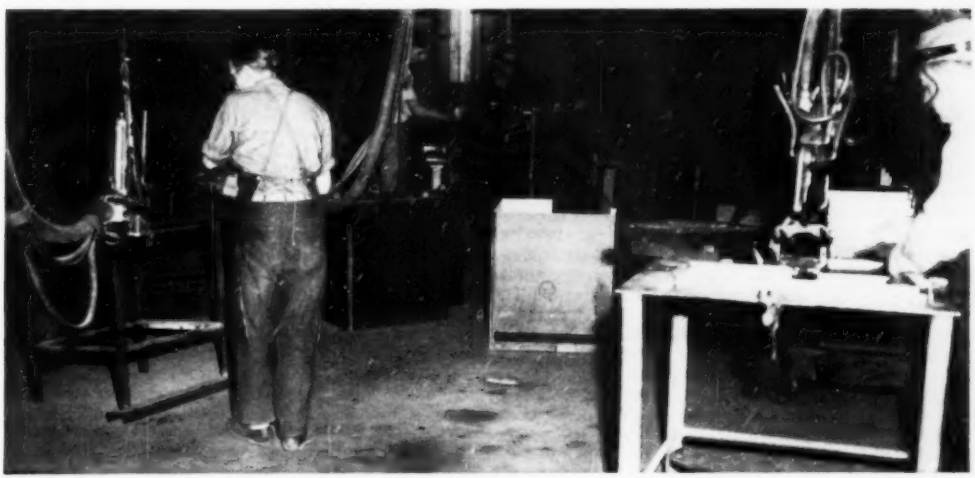


Table fixture, right, is used for assembling top sections by gun welding. This assembly is then gun welded to the back and sides in a framing fixture and transferred to a copper surface plate, left, where a gun welder finish welds the back to the top

SPRINGS CONTROL FORGING HAMMER VIBRATION

VIBRATION caused by forging hammers is a major problem. Therefore, an installation providing a new approach to the problem, has been watched with special interest in Great Britain. These special sprung and slung foundations at the Woolston Works of John I. Thornycroft & Sons, Ltd., Southampton, have been very successful.

The forging-hammer installation includes a 2-ton ram Davy steam hammer that replaced a 3000-lb Nasmyth steam hammer which operated until 1945 and was then about 80 years old. A line of four smaller steam single-frame hammers have rams weighing 500, 700, 700 and 1000 lb respectively; in addition, there is a 1000-lb Massey "clear space" pneumatically operated single-frame hammer with electric drive.

The plant deals with a wide variety of shipyard work. This ranges from connecting rods for marine engines to A-brackets for the propeller shafts of twin-screw ships.

An adjoining shop houses a number of flame-cutting machines, and it was expected that the ground vibration from the hammers would gravely impair their accuracy. The ground is typical of that found in many estuaries and may be described in general terms as an alluvial deposit of very fine waterlogged sand; a single blow from the original Nasmyth hammer caused the ground to oscillate for about a dozen cycles of vibration. Indeed, the ground vibrations caused by one of the 1000-lb hammers were visible to the naked eye at 70 ft from the machine.

First—Check the Site

The first essential was to obtain adequate information about the underlying geological strata, and for this purpose two 6-in. dia boreholes were sunk to a depth of about 30 ft. These boreholes revealed that the underlying material appeared to be estuarine silt, in which the water table had every indication of being tidal; this was not unexpected, as the plant is only about 100 ft from the water's edge.

The ground was set in oscillation by dropping upon it an iron ball weighing 1½ tons from a height of 2½ ft at several points. Today we know that ground vibrations have definite frequencies which are connected with the physical characteristics of the soil, so that ground on any site has its own natural frequency, a completely novel conception to most engineers. Vibrographic records showed a frequency of 10 cycles per sec as the natural frequency of the estuarine silt on this site.

The problem was to see that all frequencies of the forging-hammer foundations were kept substantially different from this value of 10 cycles per sec, thereby eliminating the possibility of resonance between foundations and ground.

All the new foundations for these forging hammers were designed on the basis of methods laid down by Andrews and Crockett* in a paper for which they were awarded the Gold Medal of the Institution of Engineers and Shipbuilders in Scotland for 1945. Detailed site investigation, dynamic and structural calculations, and design were carried out by J. H. A. Crockett, in collaboration with H. Randall of Thornycroft & Sons.

Standardized Type

As a basis of design, it was decided to standardize the five smaller hammer foundations, both to simplify construction and to provide complete interchangeability of component parts. This meant that hammers could be changed around at a later date, if required.

In the past, the designer has reduced both live load and ground vibration by mounting hammers of the Davy type and size on concrete blocks weighing from 80 to 150 tons, suspended from a system of spring tie rods. Such springs insulate vertical vibrations, and the pendulum action of the tie rods will combine with the inertia of the large foundation block to provide a certain amount of insulation of the horizontal vibrations. A large foundation of this type is expensive to build, requiring a large concrete lined pit or tank in which the foundation block is suspended. Owing to the lack of fundamental knowledge of dynamic action, the possibility of ground resonance was not taken into account.

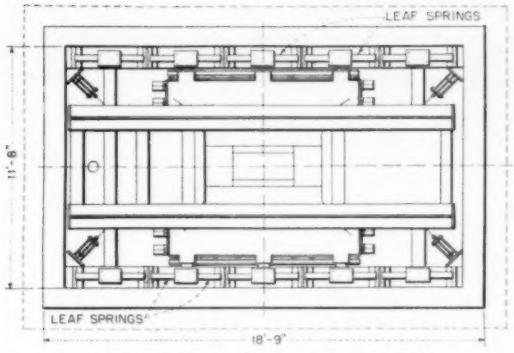
The concrete blocks for the smaller forging hammers weigh only 16 tons each, not only from economic considerations but also in order to check the accuracy of the design methods employed. These blocks are made larger on one side of the anvil centerline than on the other in order to counterbalance eccentric weight distribution of the hammer superstructure.

Impact Centered

Another important design feature is that the center of mass of the concrete block with the superstructure on it has been made to coincide as closely as possible with the point of impact of the ram on the anvil, whereby the whole machine and foundation is balanced. In each case the concrete block is suspended from leaf springs which are arranged symmetrically about the centerline. The concrete-lined pit is similarly arranged, so that the whole system is symmetrical and balanced in all its parts.

Live load was calculated by taking into account the spring constant of the timber spring pad on which each anvil rests, knowing the dynamic modulus of elasticity of the timber. A development of the theory of stress waves had to be undertaken and applied to this particular case, in order to insure that the anvil could not break or punch through the thin concrete block. This method of construction has been completely successful, amply proved by the fact that adequate support has been provided by the four rolled-steel joist canti-

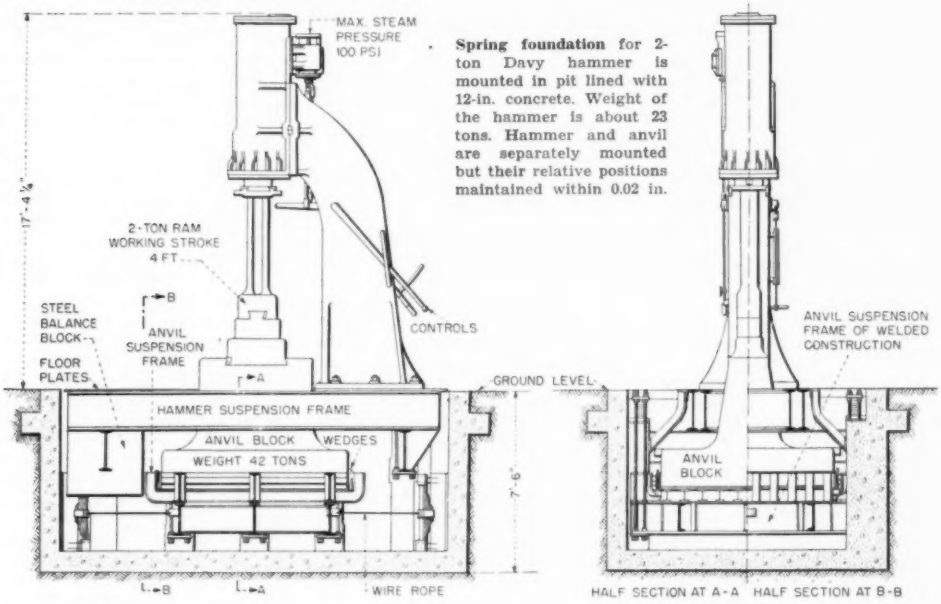
*"Theory of Forging Hammers and their Foundations" by Walter C. Andrews, O.B.E., M.I.C.E., and J. H. A. Crockett, B.Sc. (Eng.), A.M.I.C.E.—Trans. Inst. Engineers and Shipbuilders in Scotland for November, 1945



PLAN WITH FLOOR PLATES AND HAMMER REMOVED

A new and impressive approach to hammer foundations, this British installation is spring-suspended and designed for a natural frequency about one-third of the natural frequency of the ground

BY ROLT HAMMOND



Spring foundation for 2-ton Davy hammer is mounted in pit lined with 12-in. concrete. Weight of the hammer is about 23 tons. Hammer and anvil are separately mounted but their relative positions maintained within 0.02 in.

levers at the sides, and the spring-tension bar units. Concrete at the bottom of the small well was accurately finished and the well was flooded so that the concrete was matured before the hammers were brought into service. In each case the concrete balance block was given at least two months to harden before any forging operations were undertaken; the balance blocks were all cast in the pits, and then lifted into their suspended position by means of the nuts on top of the springs.

Reinforcing bars were placed in the blocks at all those places where stress concentrations might be expected, as distinct from comparatively static bending moments.

Since the ground has a 10-cps frequency, the balance block with the hammer mounted upon it was given natural ferquencies of about one-third of this, or less, for all directions; live load was thus effectively reduced and ground vibrations were also minimized.

Interference No Problem

Effect of mutual interference between hammers was examined, because in the past this phenomenon had been suspected as an important contributory factor of breakdown in some forge shops. For the benefit of mechanical research, therefore, these five small hammers and their balance blocks were deliberately put into resonance with one another, each being identical with its neighbors in important features.

Energy dispersal in the ground is by means of a train of waves which radiates from the forge, but the springs absorb an important proportion of these waves. Interleaf friction has proved to be adequate for the frequencies chosen in this case and any large build-up is prohibited. The considerable risk taken by the firm has been amply justified.

Underneath each hammer there is a sandwich of Iroko timber only 2 in. thick; this is a bastard teak, grown in the Belgian Congo and in East and West Africa. Hard and durable, it weighs 41 lb per cu ft at a moisture content of 15%. It is generally considered an excellent substitute for teak, comparing well for this particular purpose with

the best oak and pitch pine. Spring pads supporting the anvils are of the same timber, varying in thickness from 4 to 7 in.

The conventional and undesirable practice of surrounding the sides of the anvil with concrete to locate it within its well was not followed here, because such concrete invariably breaks up.

Force Unaffected

An established prejudice common in the forging industry has been exploded by this work, namely: that the force of the blow would be diminished by the spring mounting. This is not so. Moreover, maintenance charges have been much reduced, particularly in the item for breakages of piston rods. This is mainly owing to the accuracy and general precision with which the work has been done.

The general arrangement for the mounting of the 2-ton ram Davy steam hammer is shown in the drawing. The toe around the anvil block provides a base about 9 ft sq, and it was obvious at the outset that any concrete balance block would have to be large indeed and would be very costly. An alternative solution was sought, and the anvil and hammer superstructure are now each mounted directly on springs quite independent of one another, without any massive concrete block to support them or to provide inertia; the thickness of the concrete in the foundation is only 1 ft.

Oscillation Controlled

Considerable oscillational control of the anvil and of other components has been achieved. During the forging of a marine connecting rod, the author could not detect the slightest ground vibration, even under the heaviest blow. It is significant that mild-steel billets up to a cross section of 1 ft 10 in. are being forged without difficulty, work generally considered to be too heavy for a 2-ton hammer of this type.

Crockett predicted from theoretical considerations that the force of the blow would not be appreciably reduced, but that on the contrary, it might even be increased slightly by oscillational control. It is believed that this work has solved one further vexing problem: that of locating the anvil and the superstructure one to the other within fine limits of accuracy, in order that the hammer could be used for die forging, and so that "offsetting" could be brought under close control.

James Nasmyth, generally considered to be the father of the steam forging hammer, tried in every possible way to obtain a truly concentric hammer blow, but without success because of the exceptional shock and force of the blow on large hammers. Success in die forging was attained only by mounting the heavy side members of the hammer directly upon the anvil itself, so that the ram could be guided between them and directed to the anvil with the necessary accuracy. With such a design, the guides are always being subjected to the disrupting effects of shock of impact.

In this case, connection between anvil and ram receives no shock at all, location being performed by general control of oscillation through the foundations. This hammer is sited about 80 ft from the average water front and the only concrete in the foundation is the reinforced concrete retaining wall 12 in. thick and the base of the pit, the bottom of which is below mid-tide level. The drawing shows how the 42-ton anvil block sits on the welded steel cradle built up of mild steel rolled joists: on top of these, and all around the sides for a height of 9 in., is a steel plate and a layer of plywood ½ in. thick, the side parts being tightly wedged against the toe of the anvil.

No Chatter

This form of construction insures that there is no chattering between anvil and grillage, the two being accurately and permanently located together; moreover, the grillage is not subjected to the tremendous acceleration downwards of stress waves in the anvil. This is vitally important, because the three lowest members of the grillage have to cantilever outwards for attachment to the suspension system.

If downward acceleration is too great, then these cantilevers will tend to be left behind and they will buckle upwards. After being driven home, the wedges shown in the sketch were spot welded in place in order to prevent them from being jerked out. The anvil in its grillage cradle is supported by slings made of high-tensile steel bars having an ultimate tensile stress of 40-45 tons per sq in.; these slings hang within recesses in the side walls of the pit and are conveniently supported from horizontally disposed leaf springs on opposite sides of the hammer, and resting on a concrete bench formed near the top of the retaining wall.

The tops of the suspension bars pass through accurately machined bushes set in a plate fixed to the concrete. In this manner the anvil is located within the reinforced concrete foundation to an accuracy of not less than 0.02 in., an amount normally affected only by temperature changes, settlement, distortion of the entire foundation pit, or by loosening of the nuts. All these difficulties can be set to rights by tightening the nuts.

Vertical Frequency Controlled

Vertical frequency is controlled only by the six springs and is 3 cycles per second. Frictional damping brings the anvil to rest after three or four cycles. Certain horizontal oscillations have no damping or energy absorption by virtue of pure pendulum action. And therefore tension members in the form of steel wire ropes are attached to vertically disposed leaf springs all acting in the horizontal plane. These ropes act diagonally in plan on the anvil cradle, thereby providing damping control of rotational oscillations about the central vertical axis. Steel wire ropes were chosen for this purpose because they are self-damping. Frequencies are generally less than 3 cycles per second. A system has therefore been created whereby the anvil may be accurately located within the foundation, and controlled in its oscillational behavior and energy absorption.

The superstructure of the hammer is mounted on four 24-in. x 7½-in. rolled steel joints; a welded steel box is attached to the front of these and acts as a counterbalance weight to the structure; the center of mass of the whole coincides with the center of the anvil pallet.

Dynamic Load Cut

Dynamic load applied by this hammer to the ground before reconstruction was several hundred tons per blow, whereas now it is only a few tons. It is claimed that this is a successful attempt to locate ram and anvil accurately together, and that it is a pioneer effort in this field; it is remarkable that such excellent results should have been achieved with a single-frame hammer, because a hammer with symmetrically disposed side legs would probably have given a much greater chance of success.

Combination Die Produces 118% Faster

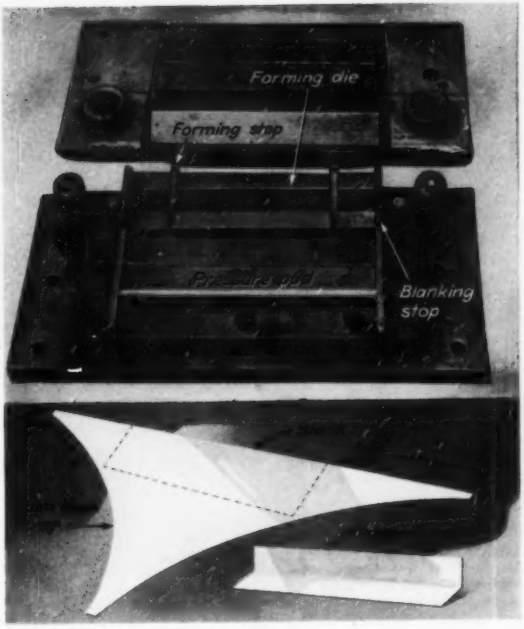
BY WALTER J. MAHANY
Vice-President of Operations
SOUTHERN STATES IRON ROOFING COMPANY

CRIMPED turpentine gutters are now made from drum-head shearings in one operation instead of four. Previously, the blanks were cut in three operations on foot shears, then formed on a power press. Two blanking shears were required to feed one forming press.

With a progressive die, blanking and forming are now done on one press, and the tedious shearing operation is eliminated. Drum-head shearings are fed to a two-station die that blanks and forms. With his left hand, the operator feeds a piece into the die. With his right hand he reaches for the next piece on a tray fastened to the press bed. Offal slides off the sides of the die. Flywheel and die area are completely screened, and the latter has a ¼-in. nonbreakable transparent shield.

The two-station die produces a gutter at every stroke. In the front section of the die, the stock is fed against stops. The two ends and the front edge of the blank are sheared by stationary shear blades fastened to the die shoe.

Within the nest created by the shear blades and the forming station, there is a pressure pad that works against rubber cushions. This pressure pad has two arms that ride up and down in cross-slots in the forming block. On the upstroke, therefore, the newly cut blank slides by gravity onto the arms and comes to rest against the integral stops. On the next stroke, the blank is formed to 90°, then is lifted by the arms out of the forming block to fall into a chute at the rear of the die.



Heart of the die is the pressure pad with two arms terminating in forming stops. The pad raises the blank out of the blanking station. The arms restrain blank at forming station, then lift the formed part out of die, so gravity will carry it into a chute

By using gravity to carry the blank to the forming station, one operator and one press now do almost as much work as three operators and three machines

Rear axles are burnished at two points in this setup on a No. 5 Gisholt turret lathe. Heavy sulfurized cutting oil is flooded over the tool at all times

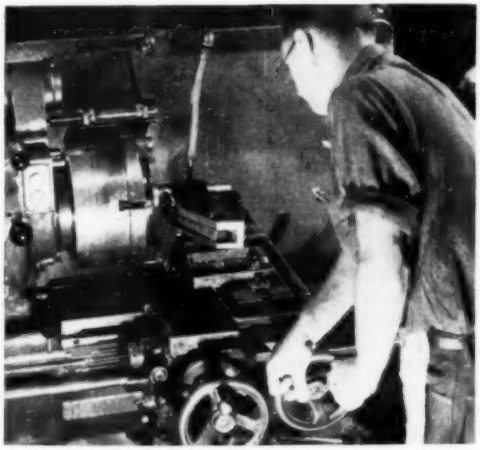
FLOATING HOLDERS SIMPLIFY ROLLER BURNISHING

It took burnished radii to stop fatigue failures in tractor shafts. Then it took floating holders to make burnishing a precision operation

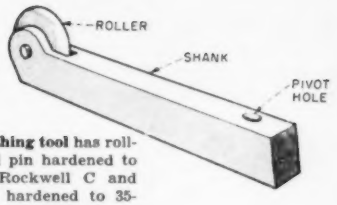
BY ELMER NEUMANN West Allis Tractor Works
ALLIS-CHALMERS MANUFACTURING CO.

BURNISHING of radiused fillets and snap-ring grooves on rear axles and pinion shafts for main drives of Allis-Chalmers tractors has been found to prevent fatigue failures. Usually the burnishing operations are performed prior to final cylindrical grinding, after finish turning operations have been completed. In some cases, the burnishing tools are incorporated in the tooling setup for rough and finish turning the shafts. In others, burnishing is done on lathes tooled only for that operation.

Until recently, burnishing rollers were mounted in heavy shanks clamped solidly to the toolposts of the



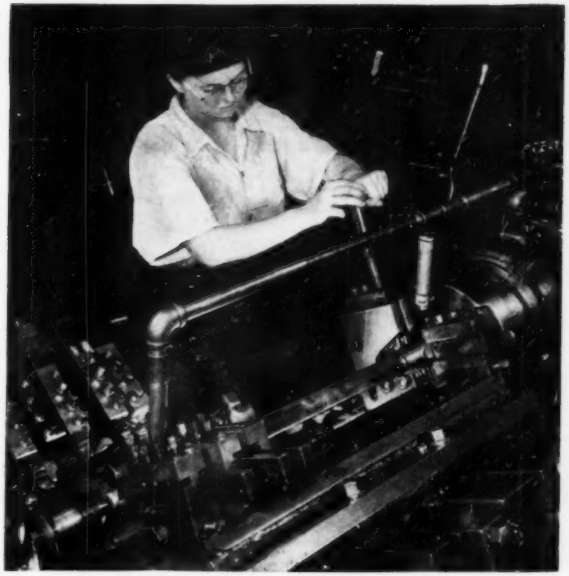
Toolpost slot is wider than shank of burnishing tool to provide floating action about vertical bolt. No tailstock center is needed because tool is working close to chuck



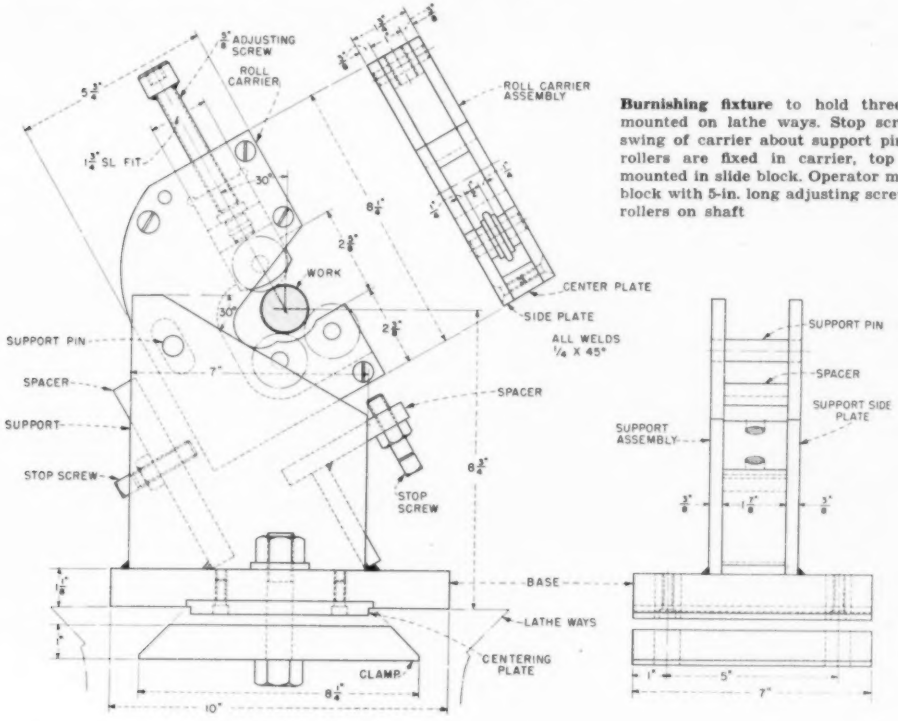
Burnishing tool has roller and pin hardened to 56-58 Rockwell C and shank hardened to 35-40 Rockwell C. Roller is a slip fit on pin

lathes. The operation was difficult to perform within close limits. However, it was noted that when carriage and cross-slide were not clamped and free to move slightly, or the roller shank was not clamped tightly and could shift, the roller had a tendency to readjust its position as pressure was applied. And in those cases the finish produced by the polished surface of the roller was much improved. As a result, all burnishing-roller holders today are arranged so they will "float" into the radius being burnished.

Roller burnishing operations are continued until all tool marks are eliminated on

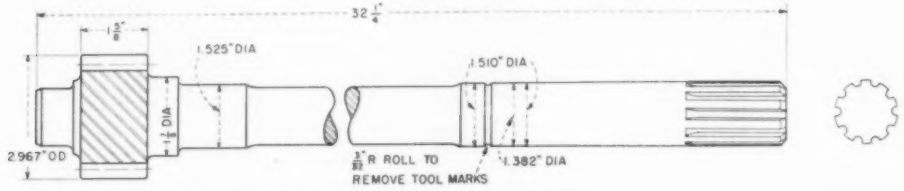


Three-roll burnishing tool finishes snap-ring groove in final-drive pinion shaft for Model WD tractor. It is clamped on ways of lathe and is used immediately after turning and facing tools

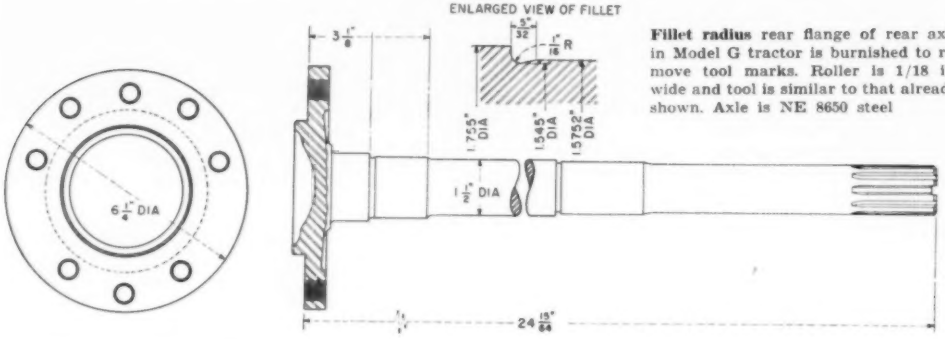


Burnishing fixture to hold three rolls is mounted on lathe ways. Stop screws limit swing of carrier about support pin. Bottom rollers are fixed in carrier, top roller is mounted in slide block. Operator moves slide block with 5-in. long adjusting screw to close rollers on shaft

the surfaces being finished. Therefore, the amount of stock left for burnishing varies with the roughness of the finish cut. In most cases, the radii at shaft shoulders have from 0.003 to 0.005 in. stock left on the diameter for burnishing. More stock is left in snap-ring grooves—sometimes as much as 0.007 to 0.008 in. on the diameter—where finish before rolling is not as smooth. Both types of condition are shown in the typical examples in the shop drawings below.

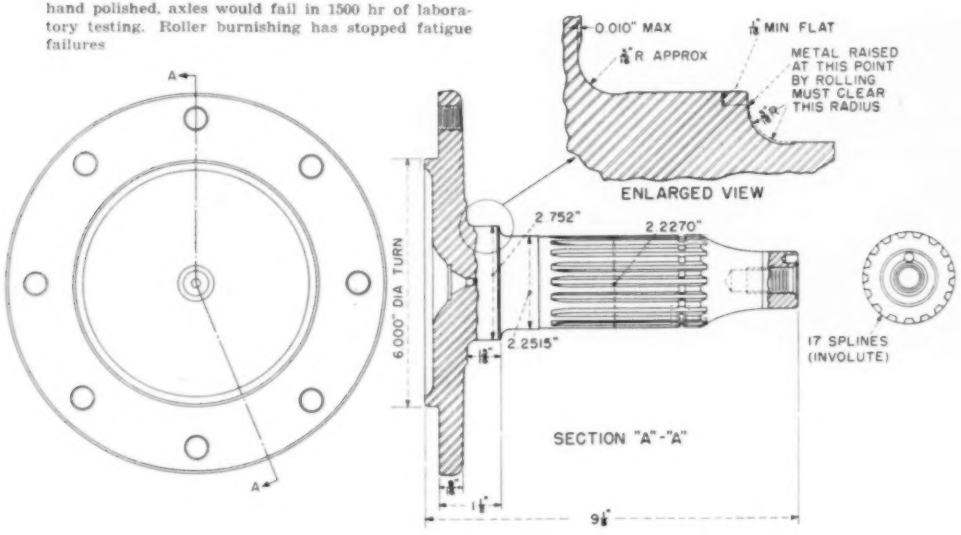


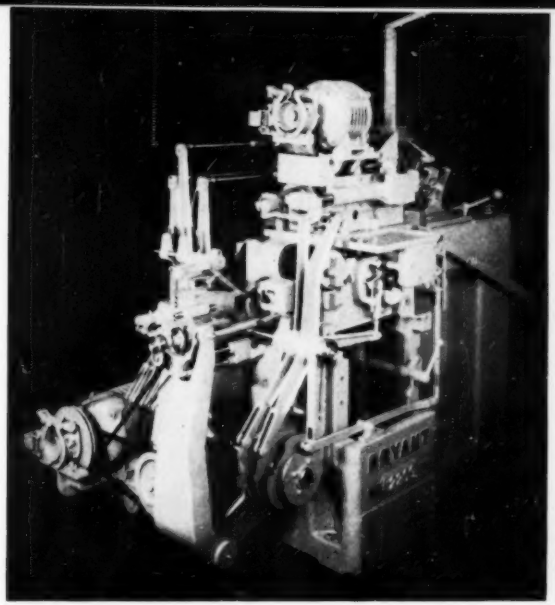
Snap-ring groove must have periphery concentric with adjacent shaft surfaces within 0.008-in. total indicator reading



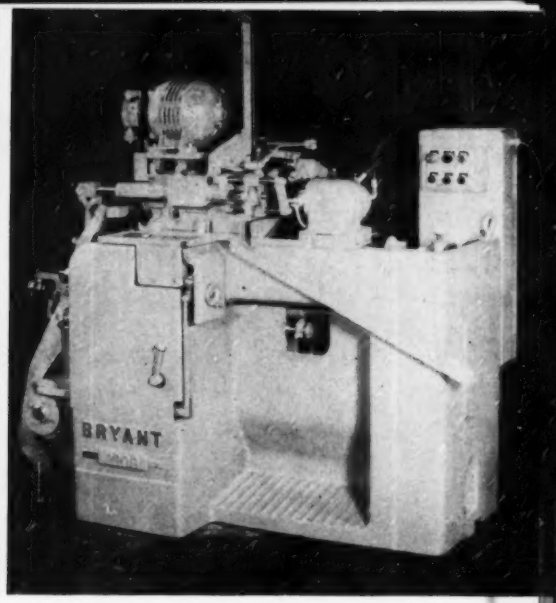
Fillet radius rear flange of rear axle in Model G tractor is burnished to remove tool marks. Roller is 1/18 in. wide and tool is similar to that already shown. Axle is NE 8650 steel

Forged rear axle for Model WD tractor is burnished on two 3/16-in. radii to maximum depth of 0.010 in. below adjacent cylindrical surface. When radii were hand polished, axles would fail in 1500 hr of laboratory testing. Roller burnishing has stopped fatigue failures





Ten cams control all steps in the cycle of this new automatic internal grinder. No hydraulics or electronics are used. It is a single-purpose high-production machine, with the workhead on a preloaded ball slide (cylindrical steel bar) sealed in a neoprene bellows



Levers will be built in and design of this prototype will be further refined before release. Facing and bore grinding can both be done because the wheelhead is set at a slight angle to avoid heel drag on the wheel. Dressers compensate for this setting

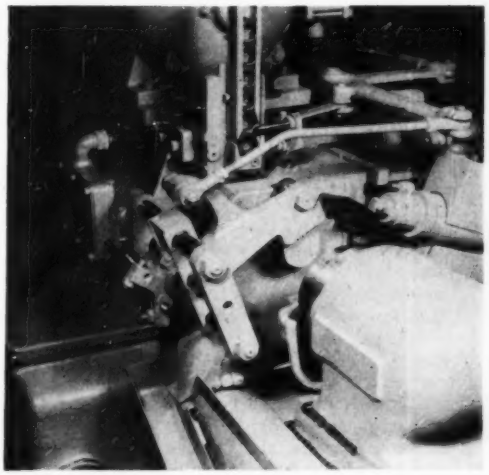
BACK TO CAMS AGAIN!

BY E. J. TANGERMAN
MANAGING EDITOR

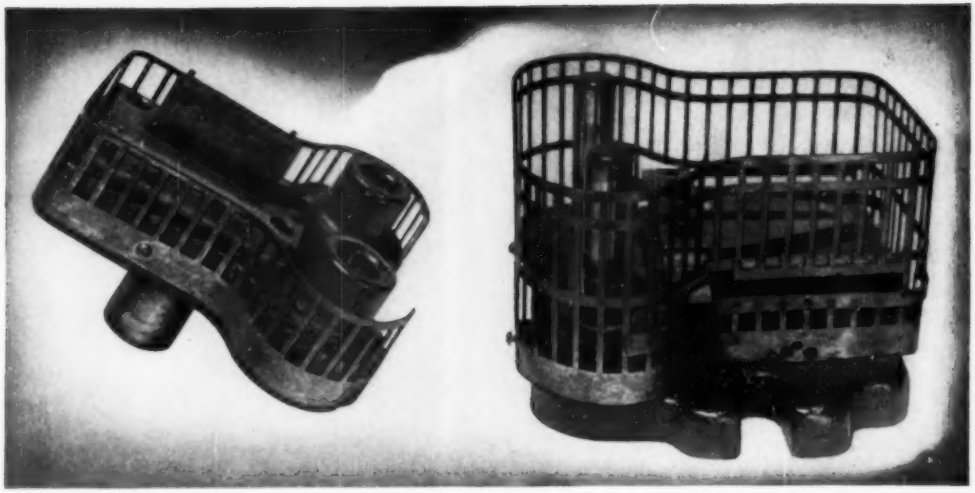
A DOZEN years ago, hydraulics were the mark of the up-to-date machine tool. Five years ago, electronics were the byword. Each multiplied production and accuracy, increased safety, cut operator fatigue. But each introduced new maintenance problems, demanded specialists and more skilled maintenance supervision. Some machine-tool users, particularly automotive companies, have objected strenuously to the temperamental new machines.

It is therefore interesting to see this prototype of a new Bryant internal automatic grinder stripped of all hydraulic and electronic devices. All elements are cam operated (and readily recycled) and the only electrical devices are limit switches, solenoid brakes and three motors, for the high-frequency wheelhead, workhead and main drive (which operates main cam and coolant pump). Low-speed cam operation avoids cam clank, so the machine is relatively quiet.

This first machine rough-grinds and finishes a 1-in. hole in an automotive bearing cup to ± 0.0002 in., also faces the inside end with the same wheel. The 4-part cycle is completed in 12 sec., producing 300 pph. Feed and wheel dressing are automatic, so one operator can handle four machines. The diamond dressers operate between rough and finish grinds, thus control hole size. Wheel wear is compensated for automatically, and when a wheel wears out (about once per hour), an automatic telltale shuts the machine down and lights a red signal.



Bearing cups are fed down the vertical slide from a hopper. A pickoff arm (shown in midstroke) puts the cup into the workhead chuck while one diamond dresses the wheel face. The wheelhead advances to rough-grind and face the inner end, retracts for dressing to size, then advances for finish-grinding. As it withdraws, the piece is ejected by air to strike the shield on the pickoff arm and drop into the ejection chute at lower left



Diemakers fit custom-made punched-stock guards to dies by cutting, bending and fastening with machine screws. Fence on universal notching die shoe has ⅜-in. clearance slots to pass 3-in. strip stock

DIE FENCES SHUT OUT PRESS

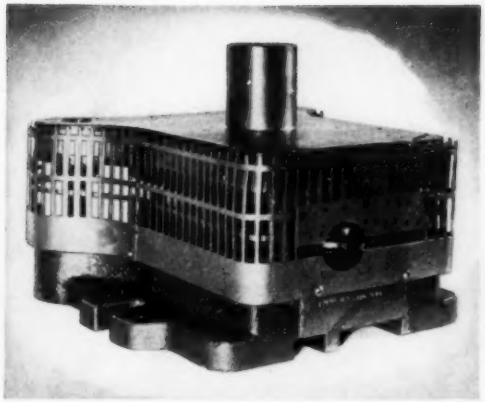
BY BEN C. BROSHEER, ASSOCIATE EDITOR

EVEN if operators go out of their way to get their hands in dangerous positions, well-planned die guards, along with automatic feeders where possible, tong or tweezer grips, and two-hand tripping devices, can cut press accidents down to practically none at all. Full-inclosure guards at General Electric X-Ray Corp. are made in the toolroom, where experienced diemakers fashion special guards for each die set. Guard drawings are usually unnecessary, because the diemakers, knowing how the die is to be employed, can make the guards in less time than would be necessary for a designer to make a drawing.

Standard guard material is 6-in. strip stock punched with square and rectangular holes with their smallest dimensions no more than 5/16 in. After the guards have been shaped to the dies they are spotwelded together and brackets are welded in place to take machine screws to fasten the guards to the dies.

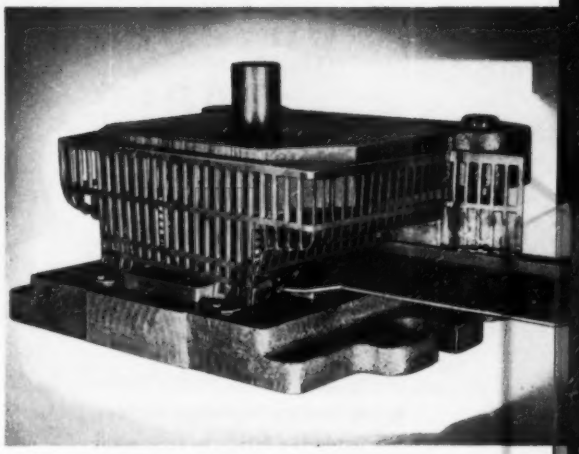
When the die opening is greater than the width of a die guard, a fence is added to the punch shoe to work inside the die fence. Mistakes in practice are avoided by dimensions stamped on the barrier for each die to indicate the maximum stroke for which that particular set can be installed without exposing the punch.

Alertness and experience promote punch-press safety, but equal credit for a good record at G E X-Ray's Milwaukee plant must be given to individual barrier guards on most of their stock of punches and dies



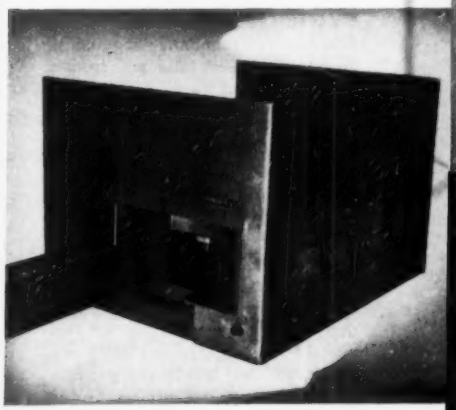
Tong clearance for front-feed die is cut in both punch and die guards. Total inclosure around all sides of punch and die even when set is open, prevents crushed fingers and forces operator to feed with tongs

ACCIDENTS



Short press stroke makes guard unnecessary for thick punch holder that overhangs die. Die guard is bent in under punch for feeding lamination stock in close and for clearing away finished stock

Side feed by hand for punching laminations shows how fence limits hand movement. Fence cutout barely clears stock for continuous press operation. Punch guard works inside die fence



Large four-post dies have sheet-metal guards with shatterproof, nonflammable plastic windows. Cut-in tunnels facilitate feed-through operations on lamination stock

How to Choose and Use PORTABLE TOOLS

PART II . . .

FALLACIES IN FIGURING

Errors in estimating savings to be realized with portable tools are usually caused by overlooking important factors. Here are listed the things to remember

Lightweight, easily maneuverable air drill successfully replaced a more bulky, underpowered electric drill and more than doubled the number of holes produced

BY H. P. BAILEY, President
THE ROTOR TOOL CO.

IN discussing the dollars and cents advantages of portable tools, a number of economic arguments encountered seem fallacious from a logical point of view.

The first is the rough-and-ready method of evaluating the time savings, which does not take into account the percentage of use. If a man works 2000 hr a year and his rate is $1.50 per hr, the user assumes that the cost is $1.50 times 2000, or $3000 per year.

As a matter of fact, there are few cases where a man's output is dependent all the time on his portable-tool equipment. With the inevitable time lost in any production shop, it is essential that the actual percentage of use be carefully determined. The new equipment is not going to save any time on non-productive activities, nor is it going to save any time on material handling or other operations which do not require tools.

Another approach to the problem either ignores or over-emphasizes the overhead problem. It is probably true that in a department with 20 men, the addition or loss of one or two men does not make any difference in the overhead. On the other hand, overhead has a peculiar way of creeping up with the addition of more men, and can be cut down with the elimination of a substantial number of them. Overhead, today, is very high, higher than at any time in American business history. The high cost of replacement of equipment is tending all the time to increase the burden, so overheads of 100% or more on direct labor, if figured in this way, and if figured correctly, are quite usual. Moreover, within the limitations of raw material supplies, all companies today are in a position in which marginal or extra business is very profitable to them, if they can produce it. It seems evident, therefore, that at least some reasonable part of the overhead should be added to the man's wage rate in figuring savings. It is no more proper to eliminate overhead entirely than it is to include it entirely, especially if it is figured on an over-all plant basis. As a matter of fact, if savings are possible by use of improved portable equipment, relative variations in the amount of direct labor rates, or overhead rates, make little difference in the soundness of the arguments for studying, analyzing and improving either portable-tool equipment or machine equipment.

If a direct labor figure of $1.20 to $1.60 is established, and then increased to a total of $2 to include a reasonable proportion of the actual overhead involved, this would appear to be fair.

Such a figure is undoubtedly quite conservative, but such conservatism lends strength to the argument for better tool equipment.

There is also some tendency to minimize the production savings of new equipment, because if these savings are stated at their true value there is a general fear that they might cause some form of indirect labor trouble. In many cases, management will say, "Well,

Increased rpm. and maintained load speed of a 180-cycle portable grinder gave one-third more production than the compressed-air tool which it replaced

One man, handling three different tools, increased production 20% over that of three men, each handling one tool, mainly by the reduction in handling time

really the saving is much greater than this, but let's call it 50%, which is good enough, and not stir anything up." Sales personnel are frequently instructed to modify case histories downwards, as regards percentage production savings, to round figures such as 30, 40 or 50%. Savings which are larger than this are not quoted because the customer will not believe them unless the situation has occurred in his own plant and is subject to his own checkup. Recent investigations as to how much saving was necessary to arouse the customer's interest in labor-saving devices, indicate that a 10 to 15% saving is all that is needed to initiate action on the part of a resourceful factory executive. If, in the future, there should be some drop-off in the volume of the metalworking industry, with today's high break-even points, it is quite possible that this figure may be reduced to as low as 5 to 10%, which is as low as can really be determined under practical conditions.

Another obvious fallacy on the part of portable tool users provides an over-emphasis on the cost of power required to operate portable tools. Generally accepted costs * rate a chipping hammer with a 40% factor of use at 3½¢ per hr., heavy-duty air drill, 2½¢; pneumatic screwdriver, 3¢; heavy-duty 8-in. grinder, 5½¢. These figures were developed in 1947 and quite possibly should be increased by 10 to 12½%. The cost of power for 180- and 360-cycle electric tools will be about 25% of these figures. However, if the cost of labor is $1.20 to $1.60 and some partial figure for overhead is added to bring it up to $2 per hr, it is obvious that the power cost is very small indeed compared to the operating costs, a ratio usually of a few per cent. If it is assumed, for example*, that the use of air is increased 50% to realize a 10% additional production result, a rather extreme situation, the extra cost of the air used will be $1.80 per day against savings of $16 per day. It is true that wherever large quantities of tools are used, it is quite proper for engineers to figure power costs closely, as a basis for long-time planning, but the individual in the shop often has an erroneous idea that the extra power used through increasing air pressure or correcting voltage is out of all proportion to the results obtained. At the same time the shop may have numerous leaks which, of course, are a source of waste that should and could be stopped.

Another error occasionally found in figuring the cost of portable tools lies in the total hours of production. Figures in this article are all based on a standard 8-hr. day, 44-hr. week. If the shop is operating at two shifts, savings are correspondingly greater. If the shop is subject to layoffs through lack of material or lack of volume, or if it expects such reductions in the future, these should be incorporated in the figures, provided the reduced use of the tools is likely to occur before they are paid for.

Considerable differences of opin-

*Compressed Air Handbook. Copyright 1947 by Compressed Air and Gas Institute.

Doubled output, with no increase in sanding-disk cost, resulted from changing a 21-lb, 2500-rpm universal electric tool to a 16-lb, 4600-rpm, 180-cycle tool

ion exist among shop men as to whether or not it pays to make major repairs on a portable tool. Experience indicates that whenever the cost of the repair is more than 50% of the cost of a new tool, serious consideration should be given to reviewing the possibilities of purchasing new tools rather than repairing the old one. Each manufacturer of portable tools makes from 50 to 400 different basic types of tools, so many new tools are available and, in addition, a large variety of much smaller and lighter tools were developed during the war which still further enlarges the possibilities of cost reduction.

Any Plant Can Save

The importance of constant revision and check-up of the portable tool program varies, of course, with the extent of the operations. With companies finishing sheet steel for household appliances, automobiles, etc., the importance of these operations is obviously great. On the other hand, in the smaller companies, they are only a minor part of the entire shop operation and, under these conditions, are almost completely ignored. However, the relative savings in proportion to the time involved are just as great, regardless of the extent of portable-tool operations.

Where a situation arises that a complete installation of portable tools is contemplated for an additional department or new building, or a complete replacement, the project should be studied by a shop committee which will develop the facts as outlined in this series of articles. The committee should approach the problem from both a practical shop angle and from an engineering standpoint, and should conclude with recommendations for a satisfactory portable-tool equipment installation. These recommendations should be supported by complete facts and figures to inspire confidence on the part of management in spending the money to put through such a program. Lack of a complete analysis leads to the natural inclination to put available cash into more expensive machine-tool programs, whereas, quicker returns can frequently be realized from the investment in portable-tool equipment. This analysis may also include a study of existing equipment which may look rather extensive to management but may actually include many tools left over from war.

A Change May Help

It may develop that in a particular situation which includes a number of tools, some other form of power-driven tool may do the job distinctly better than that already in use and which is quite satisfactory for certain operations. For example, one manufacturer had the job of drilling hundreds of 3/16-in. holes in cab frames, and was using a universal electric tool with a load speed of about 2000 rpm. Drilling, however, was slow because of the bulk of the tool and the fact that the speed dropped substantially under load. The use of air-driven tools was considered, and it was found that a tool weighing only 1 lb 10 oz instead of the heavy tool formerly used, and running at 4000 rpm, was easier to maneuver and had a side-to-center distance of only 13/16 in., which made it easier to get at the hole. Hole output was doubled.

In another case, a large midwestern iron foundry, was using an air tool at 7200 rpm with an extension spindle. It was found that a 180-cycle tool was available with a 27-in. extension, capable of running a 2-in. cone wheel at 10,800 rpm. The result of changing from the air-driven tool to the 180-cycle tool was an increase of 33 1/3% more castings per day because of the stepped-up rpm and the maintained load speed of the high-cycle grinder.

Particular attention may also be given to operations which now involve heavy, cumbersome tools. Such tools are always inefficient in production and introduce unnecessary operator fatigue.

In another example, a universal electric sanding tool weighed 21 lb with a load speed of 2500 rpm. When 180-cycle tools were installed, with a sustained load speed of 4600 rpm, the weight was reduced to 16 lb. This meant less fatigue for the operator because of easier handling, and there was no increase in sanding-disk cost, even though output was doubled.

Study Handling

Another situation which may well be investigated is the material handling situation in relation to portable-tool output. In one particular case a foundry had installed a sliding bench so, as each man finished his job, the work was moved to the next man who did a different portable-tool grinding operation. This involved moving the work for the three operations. When it was changed so all the operations were done at one point by one operator with three tools, production was increased more than 20% as a result of the increase in grinding time and the drop in handling time. Management figured, on what was considered a rather conservative basis, that by buying three new tools, the results paid for the new tools in six months, out of savings.

It goes without saying that each plant has conditions of its own, and the detailed job of analyzing portable tools and their problem is up to each factory management.

(Part 3 of this series will appear in a forthcoming issue.—Ed.)

ROUND TABLE

Ten O'Clock Scholar

"Harry Mullins came dragging in late again this morning, Al. That's three times within the past two weeks."

"There doesn't seem to be any excuse for anything like that, Ed. Lateness is bad for morale—and costs more than you'd think."

"I know it does, Al, and I told Harry so in so many words."

"When did you speak to him last about it?"

"Only last week—what gets me is that he always seems to have a good excuse."

"Name one, Ed, if you can recall it."

"Well, last Wednesday it was the alarm clock—knocked it off the stand when he came in from a party."

"Busted?"

"No, Al, he was three dollars to the good."

"I didn't mean Harry, Ed, I meant the clock."

"Oh, sure; said he'd have to get a new one."

"Well, Ed, that looks like a legitimate excuse to me. It could happen to anybody. Now can you think of another one that he gave?"

"Let me see now—oh yes, Harry had to rustle his own breakfast last Friday—said that he burned the toast twice and raised the Devil in general in the kitchen."

"The sweet woman was indisposed, I suppose!"

"Sure thing; said that she had a bad headache."

"Ed, doesn't it strike you funny that only one of your men in the shop has such a run of bad luck? Why if a half a dozen of the fellows carried on like that, the shop would go to the dogs."

"For once I'll agree with you."

"If the man is so undependable, why not give him his time?"

"We can't do that, Al; Mullins is a crackerjack after he gets here—no, I couldn't think of getting rid of him just for lateness."

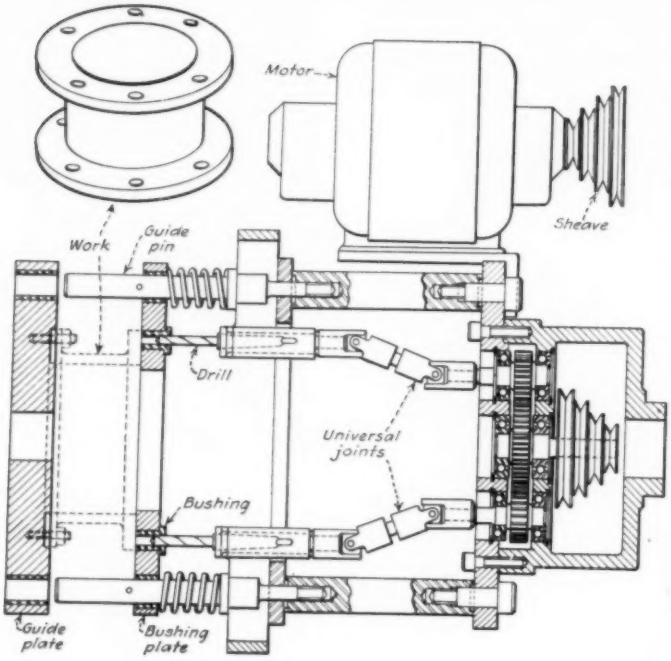
"What do you intend to do about it, put up with it forever?"

"We dock a man fifteen minutes if he's over two minutes late, don't we, Al?"

"Yeah, but that's no deterrent; we've got to do something more drastic than that. We've got to educate these tail draggers some way whereby they'll become more efficient in their personal affairs—that's at the bottom of lateness. And firing is no solution."

***WHAT ABOUT** the perennial laggard? Does talking to him ever help? What kind of penalty is successful? Your opinions and ideas will help others. Discussions of earlier topics appear on later pages.*

Practical Ideas



Multiple-Spindle Drilling Added to Turret Lathe

MULTIPLE-SPINDLE drilling operations can be done on a turret lathe with an improvement in production rates and with the elimination of a lot of handling of parts in routing them around a machine shop. This was done on a 3A W&S machine which was originally fitted to drill six holes in both flanges of a sleeve for a coaster brake.

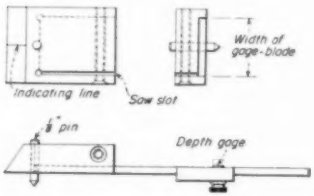
The illustrated six-spindle mechanism was mounted in one position of the turret with its driving motor attached. Parts were gripped first in a four-jaw chuck for machining by tools in the turret and in cross-slides. Then a set of holes was drilled in one flange.

A setup for drilling the second flange was made with a faceplate and guide plate drilled and bushed for guide pins in the mechanism. Parts were bolted on the guide plate and were automatically aligned so the second set of holes matched the first. Universal joints transferred power from gearing at the sheave to the drill spindles centered in sleeves.

Drill bushings were provided in the mechanism, which was belt-driven from a small electric motor. This drive allowed reversing the spindles for tapping, and a later development of the attachment was fitted so the spindles could be adjusted so various numbers of holes could be drilled. This meant changing the guide plate and drill-bushing plate, but on production runs this was quite efficient. *R. G. Dickens, Elmira Heights, N.Y.*

Depth-Gage Attachment Scribes Layout Lines

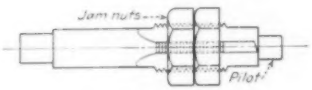
A DEPTH GAGE makes a good layout tool when it is fitted with a scribing attachment. A block of steel is milled out on the bottom and slotted with a saw. A capscrew



through a tapped hole in the block clamps the block to a depth gage.

One end of the block is beveled and a hole is drilled through the block next to the edge of the bevel to break through into the milled-out section underneath. The pointed, hardened, drill-rod pin is clamped by the end of the depth gage. An indicating line is scribed on the bevel to line up with the center of the pin.

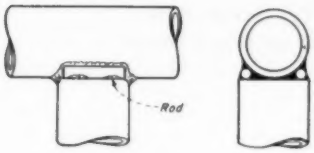
Lines parallel to the edge of a part are easily scribed with the tool, and the centered indicating line makes it possible to start or stop such a line with accuracy. *Eugene Dietz, Schoharie, N. Y.*



Special Counterbores Ground from Old Taps

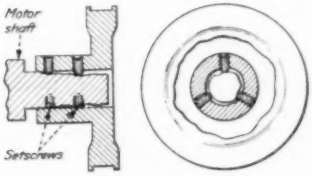
COUNTERBORES for special purposes and of odd sizes can be made from four-fluted taps, which eliminates the cost of having special tools made to order.

The threads of the tap are ground off to the required diameter, and a pilot, if one is required, is ground on the front. The flutes should be backed off for clearance. *Roger Isetts, Kenosha, Wis.*



Welded-in Pins Brace Pipe Joints

WELDED PIPE JOINTS, where one cut-off end contacts the curved surface of another, can be made much stronger if short lengths of cold-rolled-steel rod are welded into the joint. These are aligned with the rounded surface and the welder just fills in the space around them. The idea was demonstrated on welded tables and eliminated the breaking trouble we had experienced before. *Roger Isetts, Kenosha, Wis.*



Setscrews True Up Worn Pulley

A MOTOR SHAFT, driving a grinding machine through a pulley, became so badly worn that it was impossible to do any precision work, or even rough work. The hole in the pulley was elliptical, and the shaft was grooved and twisted.

Instead of ordering a new motor and pulley, which would have seriously held up a job on order, we made a temporary repair that has been left alone since because it has worked perfectly. Three holes were drilled through the pulley hub at two different points—one near the front and one near the back. These were tapped for good-sized setscrews, which were assembled with the pulley on the shaft. The pulley was centered—just like centering a piece of stock in an independent-jaw chuck—and the screws were driven down tight. *Gilbert Wida, Bridgeport, Conn.*

Mental Mathematics Solve Tap-Size Questions

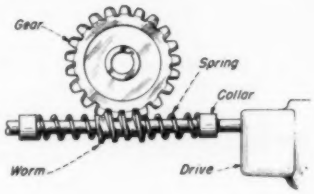
MANY MECHANICS spend a lot of time looking up the OD's of numbered taps, and this seems to me to be a waste because the sizes can easily be figured out.

The base size of the No. O tap is 0.060 in., and each successive number is 0.013 in. larger than the one before it. Thus, to find the size of a No. 6 tap, multiply 0.013 by 6 (0.078 in.) and add the base size to get 0.138 in. This is the theoretical size, and in actual practice, while taps are usually on the nose, numbered screws run from two to four thousandths undersize.

A tap drill that will cut a hole 70% undersize for a given tap can be figured by subtracting $\frac{0.974}{N}$ (N is the number of threads per inch) from the OD of the tap. *Jack Harris, Long Island City, N.Y.*

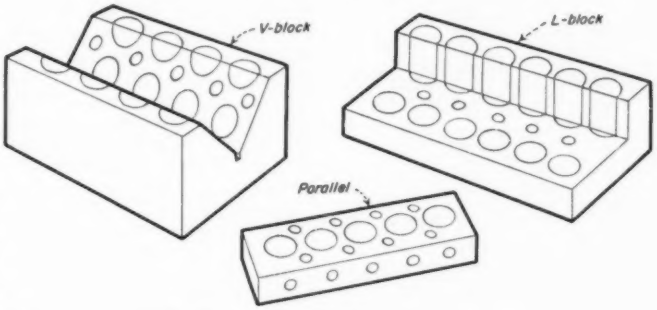
Springs Cushion Worm Shock

MOST TOOLHEADS on automatic lathes have pilot bars which enter a bracket hole to align each tool as it starts to contact the work. These are tapered slightly to make entering the hole easy and to limit shock. However, if the indexing cycle is ahead or behind that of the tool-advancing cycle, the bar may catch on the edge of the hole, causing damage to bar and tool.



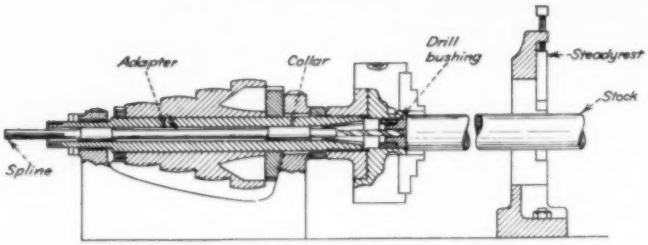
A spring arrangement at the worm drive which operates the indexing mechanism can eliminate this trouble. The worm is splined to the drive shaft, but is centered between two fixed collars by two springs. Thus, if the pilot bar jams at the head, the worm can twist in either direction, while still contacting the gear, to allow time for the jam to work out. This endwise sliding effect permits the worm to continue rotation, to a limited extent, while the gear is stopped.

Damage to machined parts, tools and pilot bars and holes is thus minimized. *Chester S. Ricker, Grosse Pointe, Mich.*



Staggered Construction Improves Magnetic Blocks

PARALLELS, V-blocks and L-blocks can be made so they will hold firm on either rectangular or circular magnetic tables with any spacing of conductor and insulator. With steel pins set in annealed brass, the parts can be aligned in any way on the table without losing magnetic attracting power. Pins are positioned so they overlap parallel magnetic strips and are ground flush with the brass blocks. *Allan B. Nixon, Springfield, Mass.*

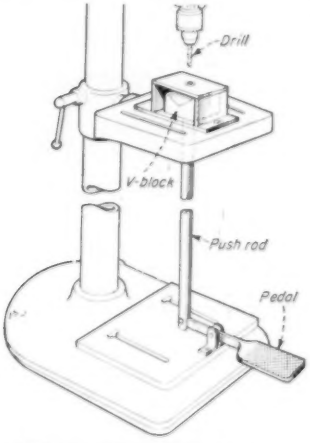


Drill-in-Spindle Setup Pierces Long Stock

THE ILLUSTRATION shows an arrangement for drilling holes in long shafts that are nominally beyond the range of an engine lathe. With a steady-rest as support for the back end of the shaft, which may overhang the machine, the front end is chucked and drilled by an adapter system through the machine spindle.

The adapter is supported inside the spindle by two or three ball bearings to allow it to be held stationary while the spindle rotates. A spline on the end of the adapter permits holding the adapter to the head of the lathe. A simple screw arrangement is employed for feeding the drill.

The drill is fixed in the end of the adapter either by setscrews or by being pressed into place. A bushing is located inside the chuck and against the work to guide the drill. If the end of the shaft is to be faced, this can be done by pressing a short shaft into the drilled hole and chucking on the section, with the large shaft moved back slightly toward the tailstock end of the lathe. *Michael P. Blake, Charleston, W. Va.*



Drilling Fixture Speeds Setup and Location

MANY SHOP JOBS require more time for setting up and putting away the jigs, fixtures and tools than is required for the actual machining operations themselves. This situation was improved for jobs involving the drilling of cross holes in rods by a V-block fixture which speeded locating.

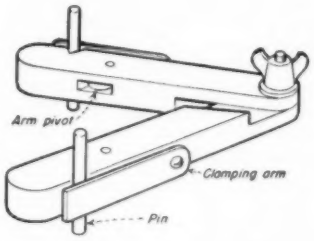
A plate fixture, welded together, was fitted to bolt to a drillpress table, and a V-block was mounted on a rod coming up through the table. This was first actuated by a pedal, but the pedal was later replaced by an air cylinder operated by a valve tripped by the vertical motion of the drill spindle. Exhaust air was employed to blow chips from the work.

Slip bushings were used in the jig for different sizes of holes. A range of rod sizes could be accommodated by the V-block, and locating and holding was easily handled by the clamping action of the block against the under side of the jig. Drill breakage was minimized because the drill spindle was always aligned with the bushing. *E. C. Schlenker, Glendale, Cal.*

Pin Holder Aids Sheet-Metal Layout

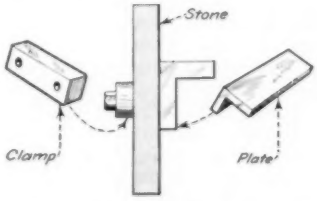
CENTER DISTANCES between holes in sheet metal are difficult to check by the pin method (with a micrometer) because the pins will not hold themselves upright, even if they are the same size as the holes, which they seldom are.

A device made with two swinging arms mounting pins vertically will help measurements. Both arms have V-cuts in which pins are held by clamping arms. The

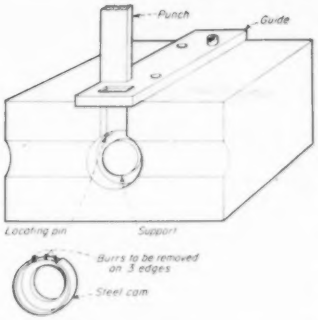


arms are hinged on pins driven through the arms, and are tightened by means of screws bearing on the arm surfaces.

With pins the required diameter clamped in the V-cuts, the device can be adjusted to a range of center distances and will hold the pins vertical for micrometer measurement. *Gerhard Wenke, Los Angeles, Cal.*



A small angle plate, bolted to a honing stone, will make squaring edges of gages and templets easy, even for inexperienced workers. The plate is machined to about 1-in. dimensions on the legs, is hardened, and is ground perfectly square. The clamp is made of any convenient steel, and is drilled to take two screws, which fit in threaded holes in the plate. An oilstone with a good flat surface should be employed. *Seymour Schreiter, Schenectady, N. Y.*



Shearing Punch Deburrs Cams

STEEL CAMS we made had burrs on three inside edges after a milling operation. Although the burrs could be removed by filing, it would have been a difficult and slow process. A solution was to make a punch and fixture that would remove all three burrs with one stroke.

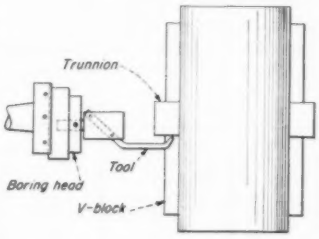
The fixture held the part vertically, with a large internal support held in the fixture by a press-fitted rod. Two small pins located the cams inside the fixture, which was cut out on front so the cams could be easily removed.

The punch was made 0.005 in. wider than the inside opening on the cam so each stroke sheared all three sides. *John K. Lukacs, S. Norwalk, Conn.*

Double-Bend Tool Turns Casting Trunnions

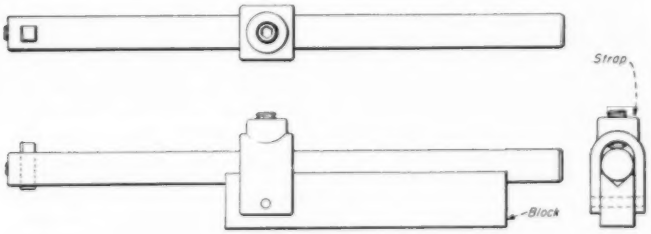
WE HAD an aluminum casting about 12 in. in diameter and 30 in. long on which two trunnions had to be turned, but we had no lathe available on which we could set up such a large job. To keep the job in our shop we made a special tool and setup on a malling machine.

After the casting had been milled to shape and size, and the trunnions had been milled square, we set it up on a V-block on the milling table—centered with the spindle. A long bent tool was made



and held in an adapter in the largest boring head we had. Two screws clamped the shank of the tool in a slanting hole.

The resulting trunnions, turned on both sides of the casting, were smoothly and accurately finished. *C. L. Bossmeyer, Rockford, Ill.*



Boring Crutch Helps on Deep Holes

THE OLD V-BLOCK comes into another good use as a support for a boring bar which is to cut deep holes. Accuracy and rigidity are maintained when the entire assembly is clamped rigidly to the lathe compound.

A clamping strap holds the bar on the support block, which centers the bar automatically. The strap is pinned to the bar through a hole, with the toolholder holding the other end. *Roger Isetts, Kenosha, Wis.*

$25 *In addition to regular payment*

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PRACTICAL IDEA

An extra payment of $25 will be made for the best Practical Idea in each number of *American Machinist*. To avoid bias, the selection will be made by readers, a different group each time.

PAYMENT—$25 in addition to regular rates for the item as published, to be paid as soon as reader votes are received—usually three to four weeks after the date of the issue. The winner will also be announced in these pages as soon thereafter as practicable.

JUDGES — A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, select the best Practical Idea. If at any time their votes result in tie, $25 will be paid to each and every co-winner. Decision of the readers will be final in each case.

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WHO MAY ENTER — Anyone may enter except employees of the McGraw-Hill Publishing Co., Inc., and those of advertising agencies or departments. Suggest to your employees that they submit ideas.

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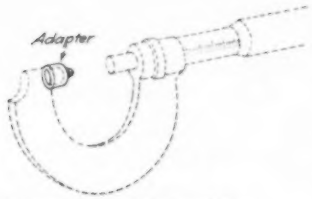
76th Winner:

Allan B. Nixon

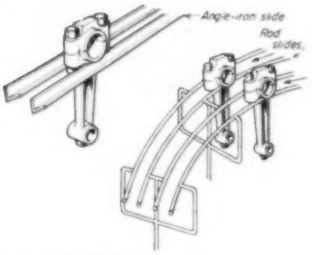
Heavy Sine Plate



Micrometer Adapted For Curved Sections

CURVED PARTS with various shapes are measured with micrometer accuracy by an adapter added to a standard 1-in. mike. A sleeve with a rounded nub was bored out to fit the anvil, and the nub was cut so as to cut down the mike opening by a round figure—0.200 in. in this case.

The adapter can be hardened drill rod or tool steel, although hardening is not necessary if only a few measurements are to be made. The length of the adapter must be deducted from each reading. *Joseph Z. Madaras, Fairfield, Conn.*



Curved Slides Route Connecting Rods

DIRECT-FEED SLIDES gravity-feed connecting rods from one machine to another at Oldsmobile's Kettering engine plant. These slides are made from 1x1x⅛-in. angle iron.

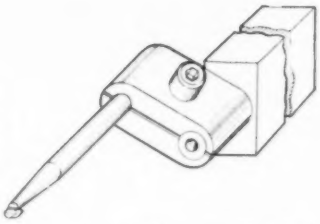
But when the slides must bend to transfer the rods to machines in other rows of aisles they are made from half-inch cold-rolled-steel rods supported on pitchfork-like frames. These prevent the work from turning and bearing against rough surfaces that would damage machined faces, and are also held so they can hit each other only on unmachined surfaces. *Chester S. Ricker, Grosse Pointe, Mich.*

Old Lathe Chucks Work Overtime

ANCIENT LATHE CHUCKS are useful in emergencies, if they haven't been thrown away. Milling and drilling work can be speeded by clamping the chuck directly to the work table and chucking the parts in the jaws. T-slots in old chucks are often useful, too, and locating pins or stops can be mounted in them or the work itself can be clamped by means of clamps or T-bolts in the slots. *Roger Isetts, Kenosha, Wis.*

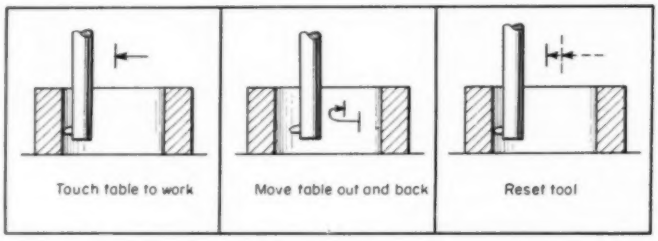
Adjustable Boring-Bar Holder Machines Out Small Holes

SMALL HOLES are easily bored with this holder, which is adjustable for height. This feature eliminates



alignment troubles encountered with most boring bars when they do not block up exactly to the center of the work.

The holder is clamped in a toolpost, aligned parallel with the lathe axis, and the height is set. The position of the tool is then adjusted, and the lateral position of the assembly is adjusted by the cross-slide movement. *Arnold Gamelsky, San Diego, Cal.*



Jigboring Method Improves Accuracy on Old Machines

JIGBORING accurate holes to given dimensions is comparatively simple with a modern machine and a precision boring head, but older machines are troublesome. If a hole is bored almost to size, the tool must be loosened, moved over, and reclamped for a final cut. This resolves itself into a guessing game.

There is a method that will make boring on an old machine easier. The hole is roughed to within 15 thousandths of size, the tool is removed, sharpened again, and reclamped so it just touches the side of the hole. Now the spindle is rotated to a position such that any motion of the table through a feedscrew equipped with a vernier will be perpendicular to the face of the hole where the tool touches. This may utilize the front feedscrew, in which case the tool must touch the hole on its left face, as the operator sees it from the front.

Now the table is moved away from the tool and then moved back to a distance of 0.005 in., or whatever radial cut is desired, from the tool. The spindle is not moved now, but the tool is loosened and reclamped so it touches the side of the hole again. This, in effect, moves the tool over 0.005 in. The spindle is raised, the table recentered to its original position, and the cut is taken. *Norman A. Benson, Rockford, Ill.*

Investment Theme at NMTBA Meeting; No Sign of Depression

CHICAGO — Investment was the main theme of the forty-seventh spring meeting of the National Machine Tool Builders' Association at the Edgewater Beach Hotel May 11-13. Investment in capital, in youth, in community relations, in Europe, in mechanization and in survival was discussed and probed by industry leaders.

Group meetings again were a feature of the program. Lloyd D. McDonald, vice president of Warner & Swasey Co., Cleveland, and president of the association, presided at the two general sessions and at the dinner.

There is no evidence as yet that an actual depression is in the offing, W. W. Townsend, partner in Townsend-Skinner & Co., New York, told members at the dinner meeting. It is important to recognize the difference between a recession and a depression. A recession is a return from an abnormally high level of activity to a normal level and is healthy. A depression is a retreat from a normal level to a subnormal level and is unhealthy. This country has merely moved pretty well into the recession stage.

In practically every previous period of credit expansion, Mr. Townsend pointed out, the proportions have been 10% government credit and 90% private credit. Today's proportions are 57% government credit and 43% private credit. Because the government can print the money if it is demanded, that much of its purchasing power is noncollapsible. We have literally put a floor under about $70 billion of excess purchasing power.

"Under these circumstances," he said, "prices may decline a little further but the ability of the public to pick up bargains when they are bargains practically guarantees against any such experience as we had in 1921, 1929 or 1937."

Purchases of cost-reducing equipment in substantial volume will represent the greatest protection our industrial system can have against the threat of growing unemployment, stated Mr. McDonald in his presidential message. He emphasized the educational task facing the industry in telling people about the nature of the industry and the function performed by machine tools.

"We must present our case from the standpoint of people living under our system of government who should get the full measure of benefits from that system," he said. "Nobody but us cares whether we make any money. But people care about the prices they have to pay, whether men are laid off, and whether our country is adequately defended."

Human Ingenuity Praised

Mr. McDonald made the point that "we are in business because we believe that human ingenuity can always contrive some way to do things better and cheaper and thereby multiply human output so that there will be more for everybody; that of course is the basic explanation of why the standard of living advances in direct proportion to the degree of mechanization."

If our country handled its peace problems as it tackled its war problems, he contended that there now

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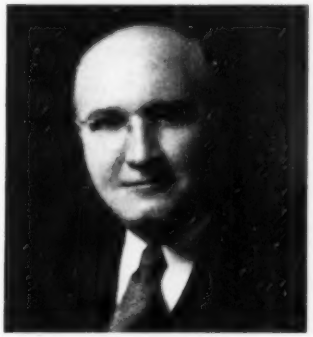


***NMTBA PRESIDENT** Lloyd D. McDonald, vice president of Warner & Swasey Co., Cleveland, who presided at the two general sessions and at the dinner at the 47th spring meeting of the NMTBA in Chicago, May 11-13.*

NMTBA Members Hear How To Improve Sales Technique

Sales technique of machine tool companies can be improved by a five point program, said James C. Hebert, general sales manager, Jones & Lamson Machine Co., Springfield, Vt., and chairman of the association's committee on sales and service, in a paper read in his absence by Daniel R. Weedon, assistant manager, Blanchard Machine Co., Cambridge, Mass. The program:

1. More thorough training of factory and distributor representatives.
2. Tabulation and presentation of more complete instructions and information on the cutting of metal.
3. More complete and detailed literature.
4. Thorough analysis of the product market and preparation of technical data for field men, showing illustrations of wide variety of applications.
5. More information for field men on merchandising and sales technique.

How ECA Places Machine Tool Orders Told by Berna

Tell Berna, NMTBA general manager, described in detail to members at the Chicago meeting how ECA operates so far as placing machine tool orders is concerned in the 16 ECA countries. Some $75 million has been allocated for U.S. machine tools by ECA in fiscal 1950.

In Italy industrialists have been so stripped of their resources that the government is lending them lira on terms up to 30 years with which to buy machine tools. Mr. Berna stressed that an ECA transaction is simply another commercial transaction, except that it is financed by the U.S. government. The ECA role is strictly a banking role.

Actual shipments of U.S. machine tools under ECA procedure during the current fiscal year have reached $30 million and will go higher, Mr. Berna reported. The $56 million set aside by ECA for purchase of U.S. machines during fiscal '49 has been reduced by the extent to which the participating nations were reimbursed by ECA for expenditures already made for American machine tools. Except for the United Kingdom, such reimbursement ended on March 1.

***PAST PRESIDENTS** of the NMTBA were honored at a luncheon at the Chicago meeting. Lower (left to right): C. J. Stilwell, pres., Warner & Swasey Co.; R. K. LeBlond, chairman, R. K. LeBlond Machine Tool Co.; R. A. Muller, former president of the old King Machine Tool Co., Cincinnati; L. D. McDonald, v.p., Warner & Swasey Co., now president of NMTBA; J. E. Gleason, chairman, Gleason Works, Rochester; J. B. Doan, chairman, American Tool Works Co.; and N. D. McLeod, chairman, Abrasive Machine Tool Co., East Providence, R. I. Upper (left to right): R. V. Geier, pres., Cincinnati Milling Machine Co.; H. W. Dunbar, formerly v.p., Machine Div., Norton Co.; J. S. Chafee, formerly v.p., Brown & Sharpe Mfg. Co.; W. P. Kirk, v.p., Pratt & Whitney Div. Niles-Bement-Pond Co.; G. H. Johnson, pres., Gisholt Machine Co.; H. H. Pease, pres., New Britain-Gridley Div., New Britain Machine Co.; and A. G. Bryant, v.p., Cleereman Machine Tool Co.*

NMTBA Spring Meeting

(Continued from preceding page)

would be in Washington a Peace Production Board to stimulate the re-equipment of metalworking plants with new and better machine tools.

Shattering the myth that American technological advancement and high employment are threatened by high corporate profits, William J. Kelly, president of Machinery and Allied Products Institute, presented these conclusions reached as a result of an analysis just completed by the institute:

1. Average corporate profits in 10 "representative good years" from 1909-48 were 9% of national income and 6% of sales. Not in one postwar year has the percentage been that high.

2. Postwar corporate profits, corrected for rising inventory costs and equipment replacement costs, have been lower in relation to national income and sales than in any previous year of peacetime production and high employment.

3. Replacement costs of inventory and fixed assets have exceeded by 60% ($19 billion) the funds set aside for such purposes by U.S. corporations during postwar years.

4. Corporation dividends in postwar years have been 3-3.5% of national income, compared with 5.3% for the 10 representative prosperous peacetime years before the war.

Income for Replacement

The manufacturer who faces squarely his replacement problem must use a substantial part of his net income, after taxes, for replacement purposes, asserted Jerome A. Raterman, president, Monarch Machine Tool Co., Sidney, Ohio. Unless he does this, chances are that he will not have the money or credit for replacement. And that is where present accounting and tax procedures are an obstacle.

Mr. Raterman made a plea for companies to set up as a depreciation reserve a portion of net earnings after taxes. If such policy were adopted, it would have an important psychological effect upon the manufacturer himself, for he then would recognize in his yearly income account the need for estimating and providing for his replacement needs.

Manufacturers should recognize that a considerable part of what they report today as profit is not profit at all, in the prewar sense, but represents money which they will have to plow back merely to keep intact their original capital investment. It is true, Mr. Raterman stressed, that the accounting profession recognized the situation and tried to develop some uniform method of handling it.

Machine tool companies should devote more time to doing a job in their own communities of selling the functions of machine tools in a free economy to their own employees, their neighbors and townspeople, said L. W. Scott Alter, president, American Tool Works Co., Cincinnati, and chairman of the association's public relations committee. Workers in plants using machine tools also must be sold on the benefits to them of increased output from new machines.

Mr. Alter outlined some of the things that individual companies can do, the list being available to association members in booklet form. He pointed out that in selling the free enterprise system, industry should use the same technique as the Communists—a local grass-roots, personal-contact basis. The fact is, he declared, that "you can't separate machine tools from the free enterprise system. They are part and parcel of the same thing."

Management should select with great care the man who will plan and supervise apprentice training, advised J. Edward Goss, industrial activities administrator, Brown & Sharpe Mfg. Co., Providence, R.I., and chairman of the association's committee on apprentice training standards. He should function as a guide, counselor and friend to apprentices.

Mr. Goss described the book of apprentice training standards prepared by NMTBA as a compilation of shop and related training deemed by his committee as a minimum requirement for an association diploma. Requirements are: (1) 6000-8000 hr. of apprenticeship time; (2) apprentice be given instruction and work experience as prescribed; and (3) related training of not less than 144 hr. for each 2000 hr. spent in shop.

5-Point Program to Help Industry Is Recommended

A five-point program to help the machine tool industry was recommended to Washington by Alexander G. Bryant, vice president, Cleereman Machine Co. and chairman of the association's Government Relations Committee, speaking at the NMTBA spring meeting in Chicago. The program:

1. Immediate liberalization of the Treasury Department's rulings to permit firms to amortize new machine tools on a realistic and shorter-term basis.

2. Freezing of present meager reserves of Army, Navy and Air Corps machine tools. No machines to be withdrawn for current defense programs or other purposes unless immediately replaced with more modern machines.

3. Exclusion of machine tools for defense program from renegotiation.

4. Stop shipment of European-built machine tools behind the Iron Curtain and prevent ECA money being used to duplicate over there productive facilities already in existence here. But at same time spend greater share of ECA appropriations for other production facilities to hasten European recovery and stability.

5. Bear in mind constantly the vital importance of keeping critical American industries, such as the machine tool industry, dynamic, competitive and virile in interests of national employment, security and welfare of all the people.

Italian Trucks, Motors To Be Made in Brazil

RIO DE JANEIRO—(McGraw-Hill World News) — Isota Fraschini trucks and diesel motors will be manufactured in Brazil under a licensing agreement which that Italian firm has made with the Brazilian government's National Motor Factory (Fabrica Nacional de Motores).

At first, Isotta Fraschini is to provide unassembled units for its I.F.D. 80 truck, which has seven tons capacity; full manufacture here is planned for the future. Brazil at present has no locally-made trucks, although American truck suppliers do some assembling in Brazil.

The Isotta Fraschini motor to be made at the National Motor Factory is a 100-hp diesel, which can be used in trucks, or in agricultural and construction tractors, as well as for vessels and for stationary work.

Push Research On Zirconium

WASHINGTON—Spurred by its success with isolation of pure metallic titanium last year, the U. S. Bureau of Mines has intensified research on pure metallic zirconium. A new system of refining the ore will be implemented at the Bureau's pilot plant in the West, expecting to halve the present $30 a lb cost of sponge zirconium.

As in titanium, zirconium will hold its structural strength up to 900 F to 1100 F, when scaling starts and oxidation weakens the structural characteristics. No alloys have been developed which will defeat this property.

Zirconium's tensile strength, at moderate temperatures, is impressive, however. Work-hardened metal is much stronger than the annealed. The work-hardened pure metal is three or four times as strong as work-hardened iron. Annealed zirconium is twice as strong as annealed iron. Compared to work-hardened mild steels, zirconium is over twice as strong and only three-quarters as heavy.

At present the metal has been brought to 97 to 98½% purity. The impurity is a rare metal called hafnium. Although there never has been enough of the hafnium isolated to provide sufficient tests of its properties, Bureau of Mines metallurgists know that it is very heavy, and has properties similar to platinum. Its ability to withstand corrosion, the metallurgists believe, will be even better than zirconium. Once a way is devised to separate it from zirconium, a completely new set of characteristics may be found for the absolutely pure zirconium, and for the new metal itself.

Demand for Security Program Metals Won't Strain Economy, NSRB Says

WASHINGTON — The demand for steel, copper, and aluminum, generated by the $24-billion national security programs will be met without seriously straining the nation's economy, National Security Resources Board says.

Answering a query by Secretary of State Acheson, regarding the impact of the various national security programs — military, stockpiling, ECA, AEC, Greek-Turkish aid, shipbuilding, arms aid to Europe — the agency found that the supply of the three metals would be sufficient.

Although the programs total more than $24 billion, only about $22.7 billion will be actually spent during fiscal 1950, says the NSRB. Of the $23 billion set out for domestic security affairs, about $22 billion will be spent during the coming year. Of the $1.4-billion arms aid program proposed by the President, about $500 million had already been budgeted, leaving about $1 billion in "new money" authorizations being asked.

Of the billion new money, $6-$7 million will be spent during the year.

Arms aid to Europe, if approved by Congress, will be made up from three sources: (1) Military equipment which the Pentagon is willing to declare "excess stocks," mainly outmoded material for which there are new models available; (2) existing equipment held in "strategic reserve" in case of an emergency; (3) industry, which would build equipment to order.

The excess material would go to Europe free; its cost is not included in the $1.4-billion estimate. Just how much is lying around and available for shipment is not known.

Material taken from the strategic reserve will be charged off to the aid program at replacement cost. This will mean business in years hence, when the military decides to replace the reserve stuff.

FCC Ban on Welding Equipment Postponed

NEW YORK—Continued manufacture and sale of all high frequency stabilized arc welding equipment for the next ninety days is allowed by action of the Federal Communications Commission in postponing, from April 30 until July 30, the effective date of an order which set forth rules with respect to radiation from electric welding devices utilizing radio frequency energy as part of the welding process.

***SKID BIN** with drop-bottom speeds handling of small forgings and machined parts by dumping parts right on the bench. The skid bin has a large eye welded to the end to which the bottom is hinged. To engage the eye and suspend the bin, a hook is secured to the top of the mast of the truck. Operator then lowers the forks of the truck allowing the bottom of the bin to hinge downward and release the load. When the bin is empty, the forks are raised, thereby replacing the bottom in its normal position, and the truck-hook is disengaged from the bin-eye by pulling the chain. The unit was built by Yale & Towne Mfg. Co's Philadelphia division to meet customer's specifications.*

German Machine Tool Industry Boosted by Lighter Reparations

By JOHN J. CHRISTIE
(McGraw-Hill World News)

FRANKFURT—The machine tool industry west of Germany's "iron curtain" has been given a new lease on life.

Two in the recent series of three-power agreements, which free western Germany for provisional statehood, have relieved the industry of uncertainties as to reparations and limitations on production.

Plans for raising medium and long-term investment capital for west German industrial rehabilitation raise hopes for a better domestic market. Improved trading arrangements, particularly in the ERP orbit, point to increased exports.

There will continue to be gaps in the range of German machine tool output as compared to pre-war. Production of certain machine tools unfortunately happened to be concentrated chiefly in industrial centers in the Soviet zone or in Berlin.

Greater Output to Result Now

Lifting of the Berlin blockade will result in greater output from plants located in the western sectors of the city, which, however, even with airlift supplies have made a remarkable showing.

But, plants in the Soviet zone and the Soviet sector of Berlin cannot be expected to become an important factor until a final settlement creating a unified Germany is achieved. Even before the counter-blockade forced Soviet zone industries to their knees, output was siphoned off as Russian reparations to a considerable extent.

Another gap in German machine tool output will result from the reparations taken in western Germany, even though the toll was much lighter than the Germans ever dared to hope for. Initial dismantlings cut chiefly into production of the heaviest types of machine tools, a policy which inevitably stemmed from the stringent interpretation of "war potential" which prevailed in the early days of the occupation before the cold war.

Machine tool production has been lagging behind other industries because of the lack of medium and long-term investment capital. Shortage of capital has been so severe that in a number of cases manufacturers have had to pass up items of equipment obtainable under ERP simply because they couldn't raise the marks.

The outlook for machine tool exports from western Germany is considered favorable, particularly among neighboring European countries which traditionally looked to Germany for capital goods. ERP's intra-European payments scheme, which obviates the dollar trading bugaboo, should do much to increase exports. Another boon to German machine tool exports would be a resumption of trade with the eastern bloc, where the tradition for German capital goods is strong. This prospect has brightened with re-opening of negotiations on the German problem.

While the Germans expect a favorable export market particularly in Europe for many months and are confident of their ability to compete pricewise due chiefly to lower wage rates, the outlook is perhaps less satisfactory from the standpoint of more distant markets, both old and potential. Their delayed recovery has given competitors in the U.S. and Britain a head start. They still lack their own commercial representation abroad, a distinct handicap in the marketing of capital goods.

Although it may not yet be a serious drawback to export business, the Germans have made very little technical improvements in their products since the war. This has been due to a large degree to the lack of adequate patent protection. While it has been possible to file patent applications for many months, there is yet no conventional patent registration office. A number of European countries and the U. S. have given official guarantee that applications will be accorded the status of regular patents as of the dates filed. However, many German manufacturers have been wary of the guarantee as not extensive enough in coverage and not sufficiently binding. A better feeling of security has grown as more countries have given their pledge but there won't be full confidence until a bona fide patent registration under the new west German state is established.

Licenses for Tool Manufacturers

Aside from prohibiting the making of machine tools directly related to production of armaments, the agreement lists 16 types of general purpose machine tools whose manufacture requires a license from the Allied Security Board.

Industry representatives consider the specifications as somewhat unrealistic but do not regard the licensing provision as unduly punitive, believing the Allies will adhere to their stated intention that approval "nor-

(Continued on next page)

More German Plants Marked for Removal

German plants still earmarked for removal under the new reparations agreement include: Reinery of Hagen, threading machines; Hettner Bohrmaschinenfabrik of Munstereifel, boring machines; Scharmann and Co. of Rheydt, horizontal boring and milling machines; Wafios Maschinenfabrik of Reutlingen, wire tooling machines, and Schmidt and Schaudt of Stuttgart, grinding machines.

Another plant not yet dismantled but released for reparations prior to the re-examination of the program by the Humphrey Committee was Ortleib and Co. of Esslingen, machines for tool grinding and small lathes.

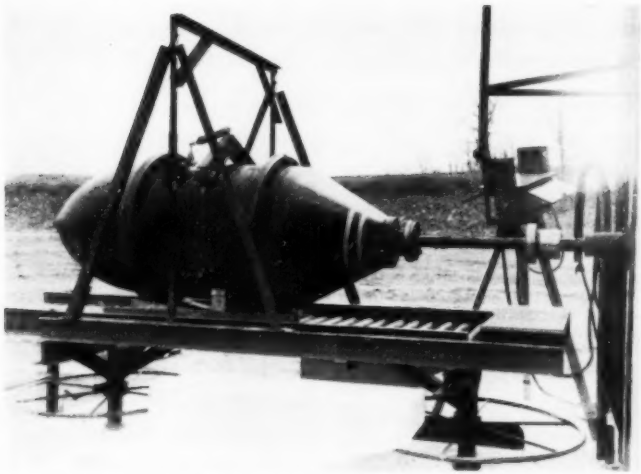
The Germans count as a heavier loss from reparations three plants which were dismantled early in the occupation. These plants, the most important makers of heavy machine tools, were Schiess AG (formerly Schiess - Defries) in Dusseldorf, which made heavy lathes, vertical lathes, boring mills and considerable amount of special machinery; Wagner of Dortmund, heavy sheet-metal working machines, and Waldrich of Seigen, heavy grinding machines and planers. (Waldrich has another plant at Coburg in the U.S. zone which is still working.)

The only other machine tool plant to have been dismantled earlier was the Hahn and Kolb Indexwerke at Islingen in the U.S. zone, makers of a noted automatic lathe. This plant went to England and is now producing as a BSA enterprise.

Bi-Zonal Tool Production Valued at 121,128,000 Marks

The value of machine tool production in the bi-zonal area last year amounted to 121,128,000 marks. Of this amount, 77,862,000 marks represented production in the second half of the year. Value of the output of machine tool plants of the bi-zonal area in 1936 was 235,000,000 marks and it was 289,000,000 in 1938. The increase was due to a 5% price increase over the two-year period as well as the fact that '38 is considered the initial year of German rearmament.

In comparing the '48 production value of 121,128,000 marks, a price level of 190% of 1936 is to be taken into account. Soviet zone figures are not available. The French zone has a production of only 10% of the bi-zone and has operated at roughly the same level.



***TELEVISION CAMERAS** have been installed by Army Ordnance Dept. to observe bomb disassembling operations, eliminating manpower risk. Remington Rand Vericon TV system is used at seven ammunition disassembly plants. Previously operators worked behind barricades, manipulating various tools by remote control to disassemble the missile.*

(Continued from preceding page)

mally will be granted unless there is reason to believe the tools are not intended for peaceful purposes."

Listing of spiral gear cutters is criticized because of the widespread use of these machines in the German auto industry. A four-ton limit on milling machines, except under license, is held to be too stringent. It is also claimed that the other specifications on milling machines are such that not even machines weighing four tons could be made anyway.

As a whole the machine tool industry has not suffered a heavy reparations toll. It had been treated relatively light even before the final reparations agreement was promulgated by the three western powers. Seven machine tool plants in the bizonal area which were earmarked for dismantling were removed from the reparations list and the French voluntarily removed four plants from the list in their zone.

Froriep at Rheidt in the British zone is the only remaining manufacturer of the heaviest machine tools of any importance. This plant, which was about 80% destroyed, is only producing at about 30% of pre-war at present.

Most serious dislocation in the German machine tool industry results from the fact that milling machine production was almost entirely concentrated in the Soviet zone. Among well-known manufacturers of milling machines and other important tools in the eastern zone are: Wanderer Werke and Muller and Montag, both of Chemnitz and makers of milling machines; Pfauter and Reinecker, two Chemnitz producers of gear milling machines; Wetzel of Gera and Union of Chemnitz, horizontal boring mills; Braun of Zerbat, lathes, and Pittler of Leipzig, turret and automatic lathes.

Seek to Re-locate in West

There has been some effort on the part of manufacturers in the Soviet zone to re-locate in the west. Pfauter of Chemnitz and Pittler of Leipzig already have established plants at Russelsheim and Langen in the U.S. zone. They have had to begin by doing repair work in order to acquire capital to equip their factories.

German Machine Tool Export Figures Given

Machine tool exports from the bi-zonal area in 1948 amounted to 8,063,333 marks, which at the 30-cent exchange rate netted $2,419,000. Leading purchasers were Britain, Belgium, Holland and France in that order.

Chief items of export since the war have been medium-sized presses, radial drilling machines, tool drilling machines, small drilling machines, lathes and grinding machines.

Exports from the bi-zonal area in 1938 were valued at 73,000,000 marks. The pre-war exchange rate, prior to Nazi export subsidies, was about 22 cents.

Reparations From Japan Eased

WASHINGTON — A yearly capacity of 37,000 machine tools — slated for removal — has been stricken from the Japanese reparations list in a unilateral decision by the United States. The action also affects eight other industries. The ten remaining countries of the policy-making Far Eastern Commission (FEC) have little choice but to go along with the reprieve to Japanese industry, since the U.S. enjoys a peculiar veto privilege in reparations questions (among other things) in FEC.

The effect of the action is to leave Japan with this yearly capacity in a selected list of industries: Crude steel, 6.4-million metric tons; pig iron, 3.6-million metric tons; machine tools (number), 37,000; shipbuilding, 800,000 gross tons; aluminum fabricating, 110,000 metric tons; ship repair, 7.2-million gross tons.

As an indication of what the reprieve means to Japanese industry, the reparations program previously okayed by the United States and other FEC countries, including Russia, would have taken away 73% of Japan's machine-tool capacity, 45% of its pig-iron capacity, 80% of its ship-building.

Plant's Men Can Install Machinery

WASHINGTON — Manufacturers of industrial machinery may use their own employees to install it. That is the nub of the National Labor Relations Board's decision upholding the International Association of Machinists (Ind.) in its long-standing jurisdictional dispute with the Carpenter's Union (AFL).

The carpenters and other AFL building trades workers struck the construction of a new power plant for Southern California Edison Co. at Redondo, Calif., after Westinghouse refused a demand of the carpenters that it employ members of its millwright local to install a steam turbine. Westinghouse was using two of its own employees, members of the Machinists Union, as well as some AFL construction workers.

The Machinists took the dispute to NLRB under the Taft-Hartley Law. The Board ruled that the Carpenters' Union could not force Westinghouse to employ its members, since that would be a violation of the closed-shop ban.

Machinists Union President Harvey W. Brown hailed the decision as a victory for his union and said he hoped the carpenters would not resist NLRB's ruling and force the issue into the courts.

Detroit

BENDIX STRIKE FORCES AUTO FIRMS TO PROBE OTHER BRAKE SOURCES
PLYMOUTH INTRODUCES SUBURBAN . . . CHEVROLET BACK IN FIRST PLACE

It's an ill wind that blows nobody good, and the strike misfortunes of Bendix Aviation Corp. at South Bend may rebound to the benefit of the tooling companies.

The Bendix Products Div. has been the sole brake source for a number of companies—Nash, Kaiser-Frazer, Packard, Hudson, Willys-Overland. It has been a primary brake source for various GM divisions and for others.

When the plant was struck early in April by a wildcat, and later in the month officially, it was simply a matter of days before all the above-named companies had to shut down. Their floats of brake and wheel parts from Bendix were so small that an immediate effect resulted from the walkout.

None had another source. The reason hinged in part on Bendix patents, which resulted in some parts made at South Bend being common to all users. In an evidently more important degree, however, the sole source situation came about because of the expense of providing duplicate die sets for separate producers.

As the Bendix walkout went beyond a month's duration, however, the outlets began to see things differently. The cost of duplicate die sets paled into insignificance alongside the costs of plantwide shutdowns in periods of boom demand. Indications were fairly definite that the former policy was being abandoned by at least some of the Bendix customers, in favor of two or more sources henceforth.

Featherbedding Is Involved

The Bendix strike issue is significant to all companies. It involves featherbedding in a form which has widespread equivalents throughout industry. Under the contract, workers are paid incentive rates for production, and are credited with standby rates during machine downtime. The company found that downtime was being reported for periods longer than actually existed — so the men were working and collecting piecework for time on which they were also being paid base rates. When the company moved to put a halt to this, by installing a check-in-check-out downtime system, striking began.

The question of work volume and pay for it is at the fore everywhere today. Communist elements in organized labor have been crying "speedup" since last fall, and they have begun to make their campaign felt. Virtually every strike or strike threat of recent months has had this issue in the foreground, whether justified or not.

The result has been, in part, a very considerable loss in automobile production. Walkouts at Midland Steel Products Co. over line speeds and rates on new parts have closed Chrysler Corp. plants an interminable number of times; when the Midland wildcats were not in progress, others were going on at Briggs with the same results. Motor Products Corp. also was visited with some of them, with similar outcome.

The speedup issue was the public issue in the Ford strike which began early in May, although it simply cloaked a tangled web of Auto Union politicking and maneuvering. Speedup cries have also been heard in a scattered few General Motors plants —usually those under left wing union domination—and elsewhere.

Automobile Production Down

Due mainly to the Ford strike, but with a plentiful assist from the effects of the Bendix walkout, automobile production in May sagged noticeably from earlier levels. Having reached upwards of 130,000 units a week, and apparently pointed for an all-time second quarter showing, volume slumped off by the middle of the month to only about 100,000.

Contrary to the postwar past, this output loss cannot be counted as simply delayed business. The slackening of automobile demand makes it appear that this business is definitely lost—that if it cannot be sold in this lush seasonal period, it may not be salable later on.

At any rate, volume is comparatively low.

May saw Micromatic Hone Corp. stage one of its fairly regular open houses, to which buyers and others were invited to inspect new products and see the Micromatic line. As usual, there were interesting things to be seen.

One of the most notable was a new movie, analyzing bearing surfaces and methods used in generating them. The film included ultra high speed shots showing micro-photographs of chip generation by tools, photoelastic sequences showing strain lines, and Schlieren photography showing heat generation. This is definitely a noteworthy job from the standpoint of both technique and information dissemination. In the shops, meanwhile, several new machines were shown for honing and mechanical lapping.

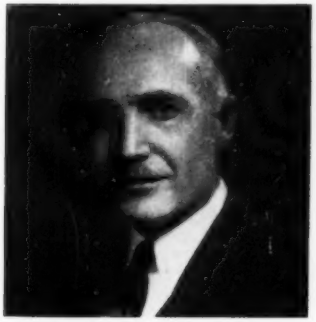
New Plymouth Utility Car

Scattered notes of the fortnight: Plymouth has introduced its combination passenger car and utility vehicle, the Suburban — a 5-passenger car whose rear end opens out, à la station wagon, to permit all-purpose use.

Just before the Ford strike put that producer on the manufacturing sidelines, Chevrolet volume for 1949 had put it in first place for the first time this year.

***MASS DRIVE-AWAY** of Golden Anniversary Packards last month started from proving grounds near Utica, Mich. More than 1,500 new gold-colored cars in the hands of dealers from every state in the country took part in the industry's first mass drive-away in nearly ten years*

Names in the News



A. J. Fitzgerald

A. J. Fitzgerald has been named general manager of The Cleveland Punch & Shear Works Co., being succeeded as sales manager by A. W. Schultz. Mr. Fitzgerald has been with the firm for 30 years, serving in a number of executive positions.

Albert F. Korf has been named sales manager of L.G.S. Spring Clutch Corp., Indianapolis, Ind., a division of Curtiss-Wright Corp. He was formerly with the Allis-Chalmers Mfg. Co., most recently as assistant to the manager of the Norwood Works, sales and engineering section of the Electrical Div.

Peter P. Ruppe has been appointed general manager of Hapman Conveyors, Inc., Detroit. He has been chief engineer of the firm, and was formerly with U. S. Rubber Co. and Briggs Mfg. Co.

Robert S. Strawsburg has been named resident field engineer in Europe for Warner & Swasey Co., Cleveland, with headquarters in Paris.

C. E. Hammond has been appointed quality engineer of the Shippensburg, Pa., division of SKF Industries, Inc., Philadelphia.

James E. Ziegler has been appointed to the sales engineering staff of The Cooper Alloy Foundry Co., Hillside, N. J. He will be stationed in Cleveland.

Clifford J. Baxter has been appointed general sales manager of Gisholt Machine Co., Madison, Wis., being succeeded as district manager of the Chicago office by **Howard V. Myers.**

Irving S. Levinson has joined Ampco Metal, Inc., Milwaukee, as manager of the process industries. He was formerly in charge of the metallurgical and testing division of the Celanese Corp., Bishop, Tex. **D. L. Coleman,** field engineer in the Detroit district for Ampco, has been named district manager of the recently established Eastern-Texas division, with headquarters at Houston.

F. S. Cornell has been named assistant manager of the water heater division of the A. O. Smith Corp., Milwaukee.

Dr. William M. Lofton, Jr., has been named director of the research and development division of Sloss-Sheffield Steel & Iron Co., Birmingham, Ala.

William Kilkenny has been named district manager of industrial truck sales in the western division of the Hyster Co., Portland, Ore. **Jack A. Cairns,** formerly assistant to the western division sales manager, has been transferred to a sales engineering position in the Los Angeles area.

Richard F. Derbyshire has been elected president of F. W. Derbyshire, Inc., Waltham, Mass. He is a grandson of the firm's founder, and a son of the late president, F. W. Derbyshire, Jr. He has been with the firm since 1937.

F. W. Bremmer

F. W. Bremmer, for 25 years with The National Supply Co., Pittsburgh, has been elected vice president in charge of manufacturing. He has been works manager of the Spang-Chalfant Division's Ambridge plant since May, 1948, and previously was works manager of the division's Etna, Pa., plant.

Wade A. Eskridge

Wade A. Eskridge, formerly assistant district manager of oilfield territory with headquarters at Tulsa, Okla., has been appointed service manager of the Twin Disc Clutch Co., Racine, Wis. **Jack N. Yetter** has been named district sales engineer in charge of the Tulsa office. **Harry T. Peck** has been appointed district sales engineer at Dallas.

Charles Lukens Huston, Sr., a steel executive who is in his 74th year of continuous service with Lukens Steel Co., has been elected an honorary member of the American Iron and Steel Institute, N. Y., for his record of long activity in the industry. Now in his 93rd year, and first vice president of Lukens, Mr. Huston started with the company at Coatesville, Pa., on December 15, 1875.

John H. Vohr, assistant general superintendent of the South Chicago plant of Carnegie-Illinois Steel Corp., has been named general superintendent of the company's Gary Steel Work, succeeding **Stephen M. Jenks,** named Chicago district manager of operations. Mr. Jenks succeeds **James M. Darbaker** who has been appointed general manager of sales. **Edwin H. Gott,** assistant general superintendent of the Gary plant, succeeds Mr. Vohr at South Chicago. **James M. Stapleton** has been appointed division superintendent of blast furnaces for the South Chicago plant, succeeding **George E. Steudel,** retired. **W. D. Miller** succeeds Mr. Stapleton as assistant blast furnaces division superintendent.

Jay W. Pickett has been appointed district sales manager of the southeastern district of E. C. Atkins & Co., Indianapolis. **C. J. Hendryx,** former branch manager and sales supervisor of the southeastern states, has retired.

Andrew J. Birch has been placed in charge of the Chicago office of Ward Steel Co., Boston. He was previously with the Providence, R. I., office.

Obituary

Joseph O. Eaton

Joseph O. Eaton, 75, chairman of the board of Eaton Mfg. Co., Cleveland, died May 15. From a small gear and axle company he formed in 1911, he developed the firm into one of the largest producers of automotive parts in the world, having ten plants in eight American cities and one in Windsor, Ont. At his death he was a director of the National Acme Co., Cleveland, and a director and member of the executive committee of Inland Investors, Inc., Cleveland.

S. B. Waring, 60, secretary-treasurer of the Morse Chain Co., subsidiary of Borg-Warner Corp., Chicago, died May 11. He had been associated with the Morse Chain Co. for the past twenty years and had been secretary-treasurer since 1945. While with Morse Chain, Mr. Waring's headquarters were in Ithaca, N. Y.

Dr. Arthur Berkeley Yates, 48, formerly chief geologist of the International Nickel Co., Inc., New York, died in Montreal May 10 after a short illness. He had been stationed for the company at South Africa and had come to Montreal to receive the Barlow Memorial Medal of The Canadian Institute of Mining and Metallurgy at the recent annual convention of the Institute.

Floyd F. Oplinger, 51, manager of electroplating service and development in the Du Pont Co.'s Electrochemicals Dept. and nationally known in the electroplating field, died May 9 in West Chester, Pa.

Emil C. Stolberg, 74, chief engineer of American Car & Foundry Co., New York, until he retired four years ago, died May 4.

Earl O. Asndin, 63, partner in H. Weiss & Co., New York, died May 8.

Frank J. Timmens, 54, retired general sales manager, Dodge Motor Co. Division of Chrysler Corp., Detroit, died May 1.

Ralph M. Shaw, general counsel and member of the board of U. S. Pipe and Foundry Co., for nearly 50 years, died May 3, at Passavant Hospital, Chicago, after a heart attack. A native of Paris, Ky., he attended Transylvania and Yale Universities and studied law at the University of Michigan.

Gerard F. Sheeran, 33, vice president and general manager of the McCabe & Sheeran Machinery Corp., New York, died May 16.

Business Items

Pacific States Cast Iron Pipe Co.'s new $3 million plant at Provo, Utah, is now in operation. The new plant has been equipped for the centrifugal casting of pipe under the De Lavaud process.

Weldaloy Products Co., Detroit, has purchased and is operating a new plant adjoining its present location, housing the metallurgical research and engineering divisions under the direction of C. R. Shroder.

Cole & Hanlon, Cleveland, has been incorporated to sell machine tools, selling standard as well as specialized machines, including the Benjamin Center Drive Automatic, Walker Hydraulic Duplicators, and Bryant Hammers. The firm will have complete coverage in Northeastern Ohio.

Ward Leonard Electric Co., Mt. Vernon, N. Y., has moved its general office from the factory building at 31 South St. to a new office building at 115 South MacQuesten Parkway.

Auburn & Associates, Inc., Pittsburgh, has moved from the Grogan Bldg. to new offices at 923 Penn Ave.

Royal Products has moved office and plant to new and larger premises at 88 Union St., Mineola, N. Y.

Harnischfeger Corp., Milwaukee, has opened a new Eastern District Service sales headquarters at Teterboro, N. J.

Gorham Tool Co., Detroit, has appointed the following distributors: Benson & Church Co., Newark, N. J.; Cooper Tool & Engineering Co., Minneapolis; W. E. Fry Co., Kansas City, Mo.

Buckeye Industries, Inc., Cleveland, has been incorporated to conduct experimental work on the finishing of jet engine parts. Officers of the firm are John T. Auwerter, Jr., president; E. E. Slabe, vice president and treasurer, and W. Thornberens, secretary.

Charles H. Besly & Co., Chicago, has opened a new Detroit office at 7376 Grand River Ave.

The A. B. Judd Supply Co., Houston, has been appointed a distributor of welding fittings and flanges for Tube Turns, Inc., Louisville, Ky.

Janette Mfg. Co., Chicago, has appointed two new representatives: Henry W. Miller Electric Co., Omaha, serving Nebraska and western Iowa, and George E. Zweifel & Co., Portland, Ore., serving Oregon, Washington and Idaho.

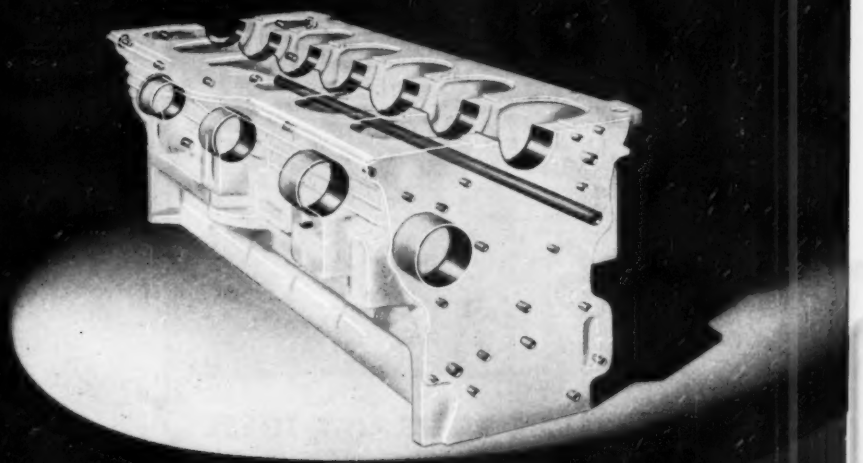
Whiting Corp., Harvey, Ill., has appointed Minnesota Supply Co., Minneapolis, agents for Whiting foundry equipment, serving the territory of Dakotas, Minnesota, and parts of Iowa and Wisconsin.

Pacific Car & Foundry Co., Renton, Wash., has received orders for 500 new refrigerator cars from the Northern Pacific Railroad and Western Fruit Express.

Standard Pattern Works, Cleveland, has moved operations of its Machine Div. to a new building at 13781 Concord Ave., Detroit. There a complete engineering department, pattern shop and machine shop are in operation.

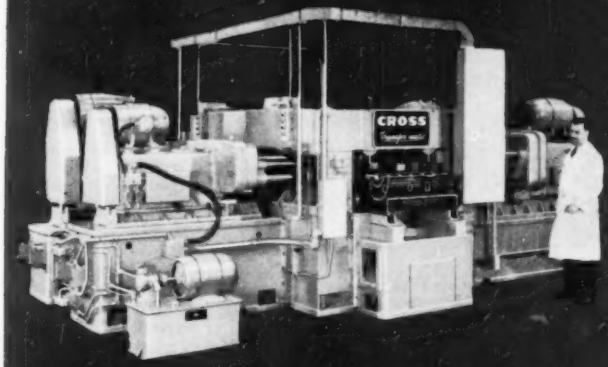
***ALLIED PRODUCTS** Corp., Detroit, in July will move its Victor-Peninsular Div. into a new plant at 12677 Burt Road. The new one-floor layout of brick and steel construction will contain modern materials-handling and manufacturing equipment. The plant will be serviced by a railroad siding off the C&O Mainline, and three shipping and receiving docks for trucks. It will contain approximately 125,000 sq ft.*

Another Transfer-matic by Cross



BORES, DRILLS, REAMS

Cylinder Blocks



★ Rough bores seven crankshaft and four camshaft bearings, drills oil gallery hole complete, drills 21 holes in front face, drills 10 holes in rear face, and rough reams two locating holes in rear face. Production requirement, 35 hourly at 100%.

★ Transfer mechanism carries parts from station to station, power elevator positions parts, and individual clamps secure parts at each station.

★ Seven stations include loading station, five working stations and intermediate inspection station.

Established 1898

THE CROSS CO.

DETROIT 7, MICHIGAN

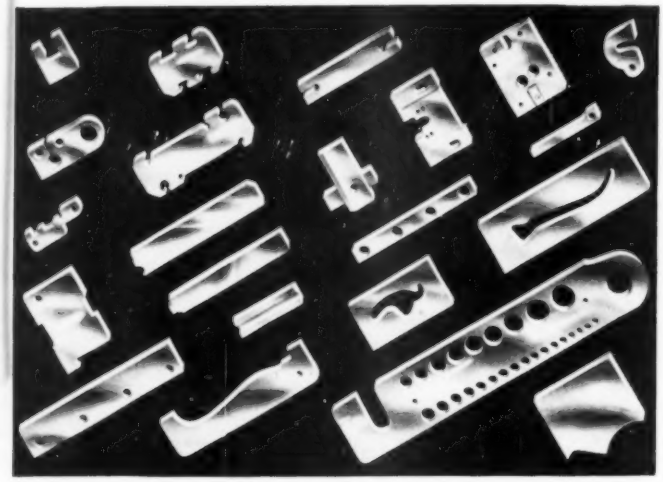
SPECIAL MACHINE TOOLS

MILLING • DRILLING • TAPPING • BORING • TURNING • SHAPING • GRINDING • HONING

SPECIFY Starrett PRECISION GROUND FLAT STOCK

ONLY TWO SIMPLE STEPS

TO MAKE PRECISION PARTS LIKE THESE



This is no time to waste time . . . especially when it's so much quicker, easier and cheaper to use Starrett Precision Ground Flat Stock for making special gages, templates, jig, fixture and machine parts, die blocks, etc. Figure what it would save in your shop. No more time lost hunting up stock. No preliminary grinding. Just select the right type and size Starrett Precision Ground Flat Stock from a handy supply at the work bench or in the tool crib . . . and go ahead. Order a supply today.

STARRETT Precision Ground Flat Stock is high grade annealed tool steel cut lengthwise from the sheet and ground to within .001" in thickness, 18-inch lengths, widths from ¼" to 10", thicknesses from 1/64" to 1¼". Each piece individually wrapped and marked with size, type and heat treating instructions.

NO. 496 OIL HARDENING

A non-deforming, electric furnace tool steel, fully spherodized annealed with fine grain structure and deep hardening characteristics. Ideal for precision parts which require accuracy of size after hardening.

NO. 495 WATER HARDENING

A high grade tool steel specially annealed for easy machining. Develops maximum hardness when quenched in water or brine and may be drawn to any desired temper in oil.

Write for Ground Flat Stock Folder and Chart "C," giving Formulas for both Oil and Water Hardening

Starrett

Standard of Precision

MECHANICS' HAND MEASURING TOOLS AND PRECISION INSTRUMENTS • DIAL INDICATORS • STEEL TAPES • HACKSAWS AND BAND SAWS • PRECISION GROUND FLAT STOCK

Buy Through Your Distributor

THE L. S. STARRETT CO. • *World's Greatest Toolmakers* • **ATHOL, MASSACHUSETTS, U.S.A.**

Horsepower for Turning and Boring With Carbide

COURTESY METHODS DEPARTMENT—CLEVELAND AUTOMATIC MACHINE COMPANY

DEPTH OF CUT	S.F.P.M.	FEED																
		0.009	0.010	0.011	0.012	0.013	0.014	0.015	0.016	0.017	0.018	0.019	0.020	0.021	0.022	0.023	0.024	0.025
1/8	125	0.19	0.21	0.23	0.25	0.27	0.29	0.31	0.33	0.35	0.37	0.40	0.42	0.44	0.46	0.48	0.50	0.52
	150	0.23	0.25	0.28	0.30	0.33	0.35	0.38	0.40	0.43	0.45	0.48	0.50	0.53	0.55	0.58	0.60	0.63
	175	0.27	0.29	0.32	0.35	0.38	0.41	0.44	0.47	0.50	0.53	0.56	0.59	0.62	0.64	0.67	0.70	0.73
	200	0.30	0.33	0.37	0.40	0.44	0.47	0.50	0.54	0.57	0.60	0.64	0.67	0.70	0.73	0.77	0.80	0.84
	225	0.34	0.38	0.41	0.45	0.49	0.53	0.56	0.60	0.64	0.68	0.71	0.75	0.79	0.83	0.86	0.90	0.94
	250	0.38	0.42	0.46	0.50	0.54	0.58	0.63	0.67	0.71	0.75	0.79	0.83	0.87	0.92	0.96	1.00	1.04
	275	0.42	0.46	0.51	0.55	0.60	0.64	0.69	0.73	0.78	0.83	0.87	0.92	0.96	1.01	1.06	1.10	1.15
	300	0.45	0.50	0.55	0.60	0.65	0.70	0.75	0.80	0.85	0.90	0.95	1.00	1.05	1.10	1.15	1.20	1.25
	325	0.49	0.54	0.60	0.65	0.71	0.76	0.81	0.87	0.92	0.98	1.03	1.08	1.14	1.19	1.25	1.30	1.36
	350	0.53	0.59	0.64	0.70	0.76	0.82	0.88	0.94	1.00	1.05	1.11	1.17	1.23	1.29	1.34	1.40	1.46
	375	0.56	0.63	0.69	0.75	0.81	0.88	0.94	1.00	1.06	1.12	1.19	1.25	1.31	1.37	1.44	1.50	1.56
	400	0.60	0.67	0.73	0.80	0.87	0.93	1.00	1.07	1.13	1.20	1.27	1.33	1.40	1.47	1.53	1.60	1.67
1/4	125	0.38	0.42	0.46	0.50	0.54	0.58	0.62	0.66	0.70	0.74	0.80	0.84	0.88	0.92	0.96	1.00	1.04
	150	0.46	0.50	0.56	0.60	0.66	0.70	0.76	0.80	0.86	0.90	0.96	1.00	1.06	1.10	1.16	1.20	1.26
	175	0.54	0.58	0.64	0.70	0.76	0.81	0.88	0.94	1.00	1.06	1.12	1.18	1.24	1.28	1.34	1.40	1.46
	200	0.60	0.66	0.74	0.80	0.88	0.94	1.00	1.08	1.14	1.20	1.28	1.34	1.40	1.46	1.54	1.60	1.68
	225	0.68	0.76	0.82	0.90	0.98	1.06	1.12	1.20	1.28	1.36	1.42	1.50	1.58	1.66	1.72	1.80	1.88
	250	0.76	0.84	0.92	1.00	1.08	1.16	1.26	1.34	1.42	1.50	1.58	1.66	1.74	1.84	1.92	2.00	2.08
	275	0.84	0.92	1.02	1.10	1.20	1.28	1.38	1.46	1.56	1.66	1.74	1.82	1.92	2.02	2.12	2.20	2.30
	300	0.90	1.00	1.10	1.20	1.30	1.40	1.50	1.60	1.70	1.80	1.90	2.00	2.10	2.20	2.30	2.40	2.50
	325	0.98	1.08	1.20	1.30	1.42	1.52	1.62	1.74	1.84	1.96	2.06	2.16	2.28	2.38	2.50	2.60	2.72
	350	1.06	1.18	1.28	1.40	1.52	1.64	1.76	1.88	2.00	2.10	2.22	2.34	2.46	2.58	2.68	2.80	2.92
	375	1.12	1.26	1.38	1.50	1.62	1.76	1.88	2.00	2.12	2.24	2.38	2.50	2.62	2.74	2.88	3.00	3.12
	400	1.20	1.34	1.46	1.60	1.74	1.86	2.00	2.14	2.26	2.40	2.54	2.66	2.80	2.94	3.06	3.20	3.34
3/8	125	0.57	0.63	0.69	0.75	0.81	0.87	0.93	0.99	1.05	1.11	1.20	1.26	1.32	1.38	1.44	1.50	1.56
	150	0.69	0.75	0.84	0.90	0.99	1.05	1.14	1.20	1.29	1.35	1.44	1.50	1.59	1.65	1.74	1.80	1.89
	175	0.81	0.87	0.96	1.05	1.14	1.23	1.32	1.41	1.50	1.59	1.68	1.77	1.86	1.92	2.01	2.10	2.18
	200	0.90	0.99	1.11	1.20	1.32	1.41	1.50	1.62	1.71	1.80	1.92	2.01	2.10	2.19	2.31	2.40	2.52
	225	1.02	1.14	1.23	1.35	1.47	1.59	1.68	1.80	1.92	2.04	2.13	2.25	2.37	2.49	2.58	2.70	2.82
	250	1.14	1.26	1.38	1.50	1.62	1.74	1.89	2.01	2.13	2.25	2.37	2.49	2.61	2.76	2.88	3.00	3.12
	275	1.26	1.38	1.53	1.65	1.80	1.92	2.07	2.19	2.34	2.48	2.61	2.76	2.88	3.03	3.18	3.30	3.45
	300	1.35	1.50	1.65	1.80	1.95	2.10	2.25	2.40	2.55	2.70	2.85	3.00	3.15	3.30	3.45	3.60	3.75
	325	1.47	1.62	1.80	1.95	2.13	2.28	2.43	2.61	2.76	2.94	3.09	3.24	3.42	3.57	3.75	3.90	4.08
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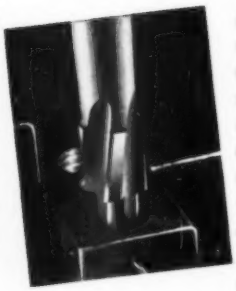
1/2	125	0.76	0.84	0.92	1.00	1.08	1.16	1.24	1.32	1.40	1.48	1.60	1.68	1.76	1.84	1.92	2.00	2.08
	150	0.92	1.00	1.12	1.20	1.32	1.40	1.52	1.60	1.72	1.80	1.92	2.00	2.12	2.20	2.32	2.40	2.52
	175	1.08	1.16	1.28	1.40	1.52	1.64	1.76	1.88	2.00	2.12	2.24	2.36	2.48	2.56	2.68	2.80	2.92
	200	1.20	1.32	1.48	1.60	1.76	1.88	2.00	2.16	2.28	2.40	2.56	2.68	2.80	2.92	3.08	3.20	3.36
	225	1.36	1.52	1.64	1.80	1.96	2.12	2.24	2.40	2.56	2.72	2.84	3.00	3.16	3.32	3.44	3.60	3.76
	250	1.52	1.68	1.84	2.00	2.16	2.32	2.52	2.68	2.84	3.00	3.16						
	275	1.68	1.84	2.04	2.20	2.40	2.56	2.76	2.92	3.12	3.32	3.48						
	300	1.80	2.00	2.20	2.40	2.60	2.80	3.00	3.20									
5/8	125	0.94	1.05	1.15	1.25	1.35	1.45	1.55	1.65	1.75	1.85	2.00	2.10	2.20	2.30	2.40	2.50	2.60
	150	1.15	1.25	1.40	1.50	1.65	1.75	1.90	2.00	2.15	2.25	2.40	2.50	2.65	2.75	2.90	3.00	3.15
	175	1.35	1.45	1.60	1.75	1.90	2.05	2.20	2.35	2.50	2.65	2.80	2.95	3.10	3.20	3.35	3.50	3.65
	200	1.50	1.55	1.85	2.00	2.20	2.35	2.50	2.70	2.85	3.00	3.20	3.35	3.50	3.65	3.84	4.00	4.20
	225	1.70	1.90	2.05	2.25	2.45	2.65	2.80	3.00	3.20	3.40	3.55						
	250	1.90	2.10	2.30	2.50	2.70	2.90	3.14	3.35	3.55	3.75	3.95						
	275	2.10	2.30	2.55	2.75	3.00	3.20	3.45										

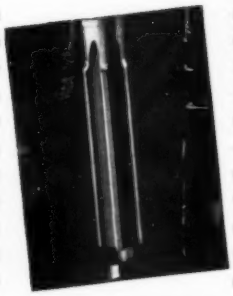
Hp = Chart value times material constant

Material Constants:

Cast iron, Bronze, X1315, 4615, 1020, St. Tubing	3	1045, 4150, 3250, St. Castings, St. Forgings	8	H.T. 4150, 52100	10
	6		9		

The above table was developed to determine how many cuts can be combined and still remain within the capacity of a given turret lathe. Entries were computed from the Carboloy Company formula: Hp = D × F × S × C × 1.33; where D = depth of cut; F = feed per rev., S = sfpm, C = material constant and 1.33 = a safety factor. The rate setter picks out a tabulated figure for appropriate conditions of feed per revolution, depth of cut and sfpm, and multiplies by the material constant, to obtain the horsepower for a given cut. If the result is well within the capacity of the machine, he considers combining another cut.

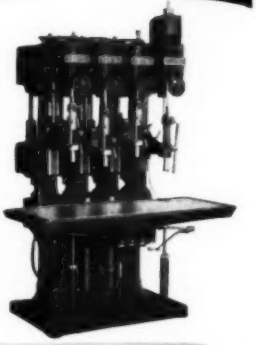




A FULL RANGE SENSITIVE DRILL FOR PRODUCTION OPERATIONS

● For continuous operation Footburt Sensitives have the sturdiness to maintain trouble-free accuracy on long runs. High speeds up to 3450 RPM for small drills on brass and aluminum work, and slow speeds down to 185 RPM for counterboring in tool steels are both available. Power feed and built-in tapping attachments may be added for highest production. Write for full particulars on this full range drilling machine.

THE FOOTE-BURT COMPANY • Cleveland 8, Ohio
Detroit Office: General Motors Building



4 spindle machine with tapping attachment and power feed attachment.

FOOTBURT *Sensitive* **DRILLING MACHINES**

A TIME TESTED LINE OF MACHINE TOOLS

Properties of Stainless Steel Fasteners

BY RICHARD E. PARET, Stainless Steel Specialist AMERICAN IRON & STEEL INSTITUTE

PRODUCTION of stainless steel fasteners has developed so that, today, several of the more common grades are stocked in essentially the same sizes and types as standard fasteners of other materials. In addition, standard fasteners are often stocked in several of the less common analyses of stainless steel. See accompanying Reference Book Sheet entitled, "Stainless Steel Fasteners Normally Stocked."

Corrosion Resistance

For most industrial purposes, 18-8 stainless steels have suitably balanced corrosion resistance, heat resistance and mechanical properties. Other grades have been developed for increased resistance to specific corrosive elements.

Industrial corrosion problems that make practical the application of stainless fasteners are:

Complete or partial destruction of the fastener because of corrosive elements in contact or atmosphere.

Contamination of the product: Textile dyeing, food processing and chemical processing involve corrosive elements.

Removability: Rust, scale and entrapped dirt, which form within and around fasteners of ordinary steels, freeze nuts, bolts, screws, etc., and make it difficult or impossible to remove them.

Where sanitary conditions are important, pitted and corroded fasteners are difficult to clean.

Delicate mechanisms such as instruments, timers, etc., decrease in accuracy when parts are corroded.

Heat Resistance

Certain types of stainless-steel fasteners maintain resistance to destructive scaling over wide temperature ranges, up to 2,000 F, depending on gas conditions. The relatively high creep strength of other types reduces the tendency of bolts and nuts under tension to elongate at high temperatures and permits firm connections.

The chromium-oxide film which protects the steel from corrosive elements at normal temperatures, thickens and discolors at high temperatures. It continues to resist corrosion and the formation of scaly or rough deposits.

Galvanic Corrosion

Many manufacturers have made the unfortunate mistake of using fasteners of other metals in stainless-steel construction. The galvanic action which results when unlike metals are used may corrode the parts.

Non-Magnetic Fasteners

The chromium-nickel stainless steels, the types in the 300 series, are non-magnetic in the annealed state. Some, such as Type 310, are non-magnetic in all conditions, providing greater strength in fasteners of cold-worked stainless steel. Thus, fasteners of these stainless steels are particularly useful where even slight traces of magnetism are undesirable.

The tiny screws in anti-magnetic watches are an important application of this type of fastener.

Non-magnetic screws, bolts, pins, keys and other parts are used extensively in critical instruments for air and marine navigation, in timing mechanisms and test devices where magnetic fields may distort indications.

Easily Cleaned

Sanitation and clean appearance are factors in the selection of stainless-steel fasteners for many uses. Their smooth surface resists the accumulation of foreign particles, and corrosion products do not form to detract from the appearance of the fasteners.

Most cleaning can be done with plain soap and water which will leave the surface as bright as new after many years of service. A cleaner such as Bon-Ami or stainless-steel wool will remove any discoloration.

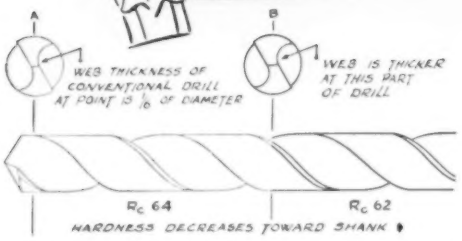
Standards of Manufacture

Standard stock items are roll formed to obtain Class 2 fits, suitable for most applications. Class 3, precision fits, are obtained by machine cutting at higher costs.

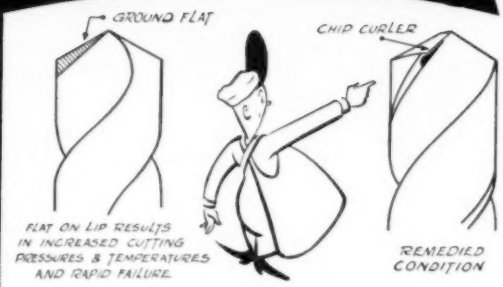
Stainless Steels Used for Fasteners

AISI TYPE	CR	NI	C	TENSILE STRENGTH, AS ANNEALED, PSI	DESCRIPTION
302	17/19	8/10	over 0.08/0.20	90,000	General use "18-8" Grade
303	17/19	8/10	max. 0.15	90,000	Free machining "18-8"
304	18/20	8/11	0.08	90,000	Reduced carbon minimizes carbide precipitation during welding
309	22/24	12/15	0.20	105,000	Heat-resisting steel
310	24/26	19/22	0.25	105,000	Superior heat-resisting steel
316	16/18	10/14	0.10	80,000	High corrosion resistance, creep strength and short-time tensile strength
317	18/20	11/14	0.10	85,000	Slight improvement on properties of Type 316
321	17/19	8/11	0.08	95,000	Titanium added to stabilize carbon at elevated temperatures and during welding
347	17/19	9/12	0.08	100,000	Columbium added to stabilize carbon at elevated temperatures and during welding
405	11.5/13.5	——	0.8	90,000	Aluminum added to retard air hardening during cooling from welding temperatures.
410	11.5/13.5	——	0.15	75,000	Basic heat-treatable type
416	12/14	——	0.15	95,000	Free-machining modification of Type 410
430	14/18	——	0.12	70,000	Basic non-hardenable chromium type
431	15/17	1.25/2.50	0.20	135,000	High strength and corrosion resistance
446	23/27	——	0.35	95,000	Heat- and scale-resistant type

Short drills solved a problem for *Stainless Sam*

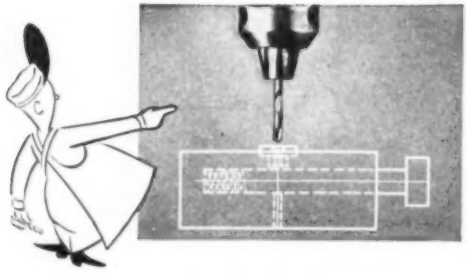

A
B
WEB THICKNESS OF CONVENTIONAL DRILL AT POINT IS 1/16 OF DIAMETER
WEB IS THICKER AT THIS PART OF DRILL
Rc 64
Rc 62
HARDNESS DECREASES TOWARD SHANK

1 A screw machine shop was having trouble with poor drill performance on thin-walled stainless steel parts. Stainless Sam learned the shop men were using shortened drills made from long ones. Since the web of the drill becomes thicker toward the shank, it was necessary to thin the web to reduce cutting temperatures. (Because of the thin wall of the part, heat could not be conducted away from the drill.)

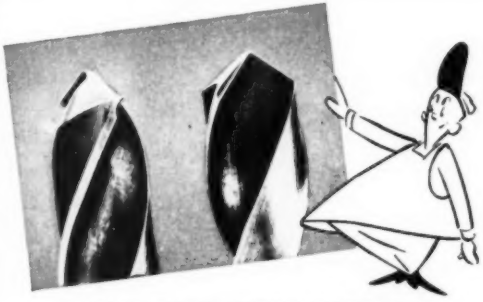

GROUND FLAT
CHIP CURLER
FLAT ON LIP RESULTS IN INCREASED CUTTING PRESSURES & TEMPERATURES AND RAPID FAILURE.
REMEDIED CONDITION

2 When the web was thinned out, the helix angle of the drill was lost. There was ***no chip curler at the lip.*** The flattened drills then cut with a zero degree top rake angle instead of the approximate 10-degree angle recommended for stainless steel. Grinding in a chip curler remedied the condition.

The easiest and quickest way to avoid these troubles, Stainless Sam says, is to use only short drills made specifically for screw machine work.



3 Bushings should always be ***short*** when you are using a drill jig. This makes it possible to use a short drill. Removable bushings can be used if chip congestion in the bushing is a serious problem.



4 For the average machining job, Stainless Sam recommends that drills be backed out at intervals to relieve chip congestion. The general rule for automatic screw machine work is three to four times diameter of drill for first insertion, one to two diameters for second, and three-quarters for the third and fourth. Drawing shows groove that assists chip elimination on automatics.

If you are not using ARMCO Stainless Steel bars or wire, perhaps parts of your equipment or products could benefit by these rustless metals—often at ***no increase in cost.*** ARMCO Stainless resists heat and corrosion, adds strength and beauty to the products you make.

For complete up-to-the-minute information on drilling and other machining operations, write for a copy of the Armco booklet, "Machining of ARMCO Stainless Steels."

And remember, ARMCO Stainless Steel bars, wire and angles are available for quick delivery. Just write Armco Steel Corporation, 264 Curtis Street, Middletown, Ohio. Or call our nearest district office or ARMCO Distributor.

Export: The Armco International Corporation

ARMCO STAINLESS STEELS

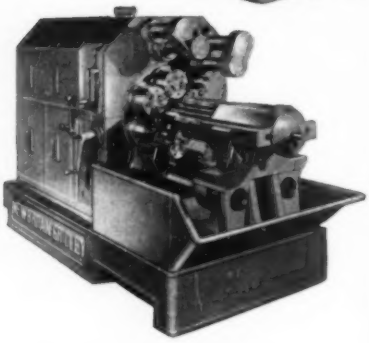
ARMCO

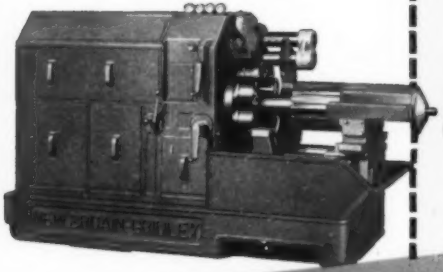
Stainless Steel Fasteners Normally Stocked

TYPE	CHARACTERISTICS	AVAILABILITY
MACHINE SCREWS	Flat Countersunk Head Round Head Filister Head Truss Head Oval Countersunk Head	Normally available in AISI Type 304 stainless with coarse or fine, rolled threads (Class 2) in sizes No. 2 through $\frac{3}{8}$ in.; lengths, $\frac{3}{16}$ to 3 in. Often available from stock in other AISI types of stainless.
NUTS	Hexagon Nuts: American Standard Regular Coarse or Fine thread	Normally available in AISI Type 303, milled from bar, (Class 2) in sizes $\frac{1}{4}$ to 1 in. Also available in special analyses.
	Hexagon Nuts: American Standard Heavy	
	Hexagon Nuts: Machine Screw Nuts	AISI Type 303 stainless, coarse or fine, Class 2, for screws. No. 1 to $\frac{1}{4}$ in.
	Hexagon Nuts: Castellated	AISI Type 303 stainless, coarse or fine, threads, in sizes from No. 10 to 1 in.
	Cap Nuts	AISI Types 303 and 416 stainless, coarse or fine thread, in sizes from No. 8 to $\frac{3}{8}$ in.
	Wing Nuts	AISI Type 303 stainless, coarse thread, in sizes from No 8 to $\frac{5}{8}$ in.
	Other	Special analyses, types and sizes available on order if not in stock.
BOLTS AND CAPSCREWS	Capscrews and Bolts, Hexagon Head, AISI Type 304 Stainless	Coarse: Diameters: $\frac{1}{4}$ to $\frac{1}{2}$ in ; lengths, $\frac{3}{8}$ to 6 in.
		Fine: Diameters, $\frac{1}{4}$ to $\frac{1}{2}$ in.; lengths, $\frac{3}{8}$ to 6 in.
	Capscrews, Socket Head, AISI Type 303 Stainless	Coarse: Diameters, No. 6 to $\frac{3}{4}$ in.; lengths $\frac{1}{4}$ to 3 in.
		Fine: Diameter, No. 10 to $\frac{1}{2}$ in., lengths, $\frac{5}{16}$ to 3 in.
	Square-Head Bolts	AISI Type 304 stainless; diameters, $\frac{1}{2}$ to $\frac{7}{8}$ in., lengths $\frac{5}{8}$ to 4 in.
	Carriage Bolts Round Head—Square Shank	AISI Type 304 stainless; diameters, $\frac{1}{4}$ to $\frac{3}{4}$ in.; lengths, $\frac{3}{4}$ to 5 in.
	Lag Bolts*	AISI Type 304 stainless; diameters, $\frac{1}{4}$ to $\frac{3}{4}$ in.; lengths, 1 to 6 in.
	Capscrews and Bolts Flat Countersunk Head	AISI Type 304 stainless; diameters $\frac{1}{2}$ to $\frac{3}{4}$ in.; lengths, $\frac{3}{4}$ to 5 in.
WOOD AND SHEET-METAL SCREWS	Wood Screws: Flat Countersunk Head Round Head Oval Countersunk Head Truss Head	AISI Type 304 stainless Wire gage No. 4 to No. 18 (0.112 to 0.295 in.) Lengths $\frac{1}{2}$ to 4 in. Cold headed, cut threads
	Machine Screws: Round Head	AISI Type 304 stainless
	Machine Screws: Oval Countersunk Head	A and Z point Diameters, No. 4 to No. 14; lengths $\frac{1}{4}$ to 1 in.
RIVETS	Round Head Flat Head 90° Flat Countersunk Head	AISI Type 304 stainless; diameters; $\frac{1}{16}$ to $\frac{3}{8}$ in.; lengths $\frac{1}{8}$ to 2 in.
	Tinners	AISI Type 304 stainless Diameters, 0.092 to 0.259 in.; lengths, $\frac{5}{16}$ to $\frac{1}{4}$ in.
SET SCREWS	Square-Head, Cup Point	AISI Type 304 stainless; diameters $\frac{1}{4}$ to $\frac{3}{4}$ in.; lengths, $\frac{3}{8}$ to 3 in. hot forged.
	Socket-Head Cup Point	AISI Type 303 stainless; diameters, No. 6 to $\frac{3}{4}$ in.; lengths, $\frac{3}{16}$ to 2 in. coarse or fine threads.
	Slotted Headless Cup Point	AISI Type 303 stainless; diameters, No. 6 to $\frac{5}{8}$ in.; lengths $\frac{3}{16}$ to 1 in.
WASHERS	Flat-Commercial	AISI Type 302 stainless; bolt sizes, $\frac{3}{16}$ to 1 in.; inside diameter, $\frac{1}{16}$ in. over bolt size.
	Flat-Light	AISI Type 302 stainless; bolt sizes, No. 3 to 1 in.; inside diameter, 0.109 to 1.016 in.
	Lock Washers	AISI Type 303 stainless; bolt sizes, No. 2 to 1 in.
PINS	Taper Pins Tapered $\frac{1}{4}$ in. per foot	AISI Type 303 stainless; diameters $\frac{1}{16}$ to $\frac{11}{64}$ in.; lengths $\frac{3}{16}$ to $1\frac{3}{4}$ in. Diameters, $\frac{5}{16}$ to $\frac{43}{64}$ in.; lengths, $\frac{3}{4}$ to 5 in.
	Cotter Pins Extended Prong	AISI Type 302 stainless; diameters, $\frac{1}{32}$ to $\frac{3}{8}$ in.; lengths $\frac{5}{16}$ to 4 in.
NAILS	Common Wire	AISI Type 302 stainless; sizes, 2d to 60d

NOTE: The ranges of dimensions listed in the above table are not necessarily inclusive as to any given diameter or length.
*Square head, gimlet point.

SPECIAL FEATURES...
mean better production methods





NEW BRITAIN
Automatic
4-6-8 Spindle Chuckers

HYDRAULIC CHUCKING for simple positive control and rapid action. Chucking pressures automatically reduced in finishing positions, if necessary to prevent distortion.

FLAT CROSS SLIDES AND SWINGING TYPE FORMING ARMS make New Britains equally adaptable to heavy cuts and a wide variety of types of work.

SPINDLE STOPPING MECHANISM positions spindle automatically in loading position, or any other position necessary to perform work requiring a dead spindle. A safety device prevents carrier index before completion of chucking operation.

CARRIER LIFTING, LOCATING AND LOCKING MECHANISMS during index preserve initial accuracy by eliminating both wear and weave from the spindle carrier.

DOUBLE INDEX of spindle carrier with loading in two positions permits finishing both ends of a piece in a single cycle, or two pieces per cycle.

ACCELERATED OR DECELERATED MOTION, separate from turret, changes feed rate of any end working tool for different operations. Drill speeders in all positions.

ANTI-FRICTION BALL BEARING on hydraulic chucking distributor eliminates the wear and heat of metal-to-metal contacts and permits high spindle speed.

OPEN END CONSTRUCTION provides complete accessibility to the tooling area, and easy chip removal.

These important mechanical features are the basis for the adaptability and accuracy of New Britain chuckers and the new, better machining methods they make possible. May we send you the portfolio "It Can Be Done." It contains numerous cost histories showing the results in terms of cost-per-piece and pieces-per-hour. Frequent supplements are issued to those who request this valuable service.

619MJ1

THE NEW BRITAIN MACHINE CO.

NB

NEW BRITAIN

Automatics

THE NEW BRITAIN MACHINE COMPANY
NEW BRITAIN-GRIDLEY MACHINE DIVISION
NEW BRITAIN, CONNECTICUT

TALKING SHOP

Customers First

IN MACHINERY, as in automobiles, it is a good idea to find out what the customers want before design starts. One builder tried this method recently and now should cash in on a new machine that is an important departure from previous ideas.

Hard Drilling

OLEIC ACID will both keep drills cool and lengthen life between grinds when hard steels, such as drill rod, must be drilled. A small shop discovered this, made initial tests with the pure acid. Eventually, a shift was made to the "technical grade," which does all the pure grade does, and costs considerably less.

Crush Dressing

DON'T KEEP A CRUSHER ROLL in contact with a grinding wheel being crush-formed a revolution longer than necessary. It is a common mistake to continue for several revolutions after the final form is achieved, but this practice is responsible for excessive wear on the crushing roll.

Hot Rods

TIE-ROD CONSTRUCTION is used in one of the big mechanical presses being installed by Wyman-Gordon at the Harvey, Ill., plant. These rods are being wound with induction-heating coils for a distance of about 2 ft. near one end. In erecting the press, the coils will be hooked to the induction-heating equipment in the plant. When the rods are expanded the nuts will be drawn up and the coils disconnected. Coils will be left in place and can be reconnected when rods need further tightening.

Lubricant

HEINZ LANDAUER suggests these definitions: A good oil is one that causes a machine to run without a motor; a better oil makes the machine drive the motor. To get a definition of the best oil, ask any one of the lubricant manufacturers.

Swell Hole

WHEN YOU BREATHE into a ring gage, what happens to its diameter? Well, contrary to what we thought, the hole *gets smaller before it gets larger*. In the first place, your breath heats the inner surface, which expands. But the outer metal of the ring won't let it expand outward—so the hole gets smaller (about 5 to 10 millionths on a 2-in. ring, for example). Then the heat is conducted to the outer metal, so the gage expands—usually so the bore is oversize as much as it was under. Then, as the heat is dissipated, the gage comes back to normal dimensions.

No Grievances

ALTHOUGH a militant union represents the workers in a certain plant, there hasn't been a grievance complaint in 4½ years. Secret of this success, apparently, is the fact that labor matters are handled by top management itself. Firm but just dealing and a genuine interest in worker welfare have paid handsome dividends in the case of this company.

Machine Alignment

SOMETIMES people do not seem to understand the importance of good machine alignment on quality of work produced. Example: A lathe was recently installed with the bed not leveled, so that the machine actually cut a taper. Should more information be published on inspection standards for various kinds of machine tools, in order to aid those who install and maintain them?

Powered Push

TO SAVE BACKACHES and get quicker results, a portable, power-operated rack is a useful device when sliding one machine member on another to establish the bearing. The device should incorporate the means to change the stroke to suit the job.

Flexible Welder

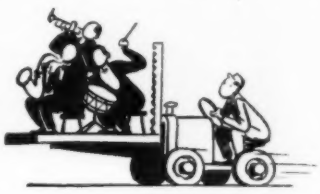
BEATTY MACHINE & MFG. CO., Hammond, Ind., fabricates most of its frames for punching machines and hydraulic presses from steel plate. Submerged arc welding was desirable, but available equipment would travel the head in only two directions, at right angles to each other. Plates are often so heavy that accurate positioning is difficult and frequent repositioning impractical. So Beatty erected a column alongside a building column. A horizontal beam mounted to this can be adjusted vertically by a screw and swung manually about the column. Near the end of this beam and pivoted to it, a second beam which carries the welding head will travel along any desired line within a radius of about 15 ft. from the column. This gives real flexibility to the whole welding setup.

Tool Grinding

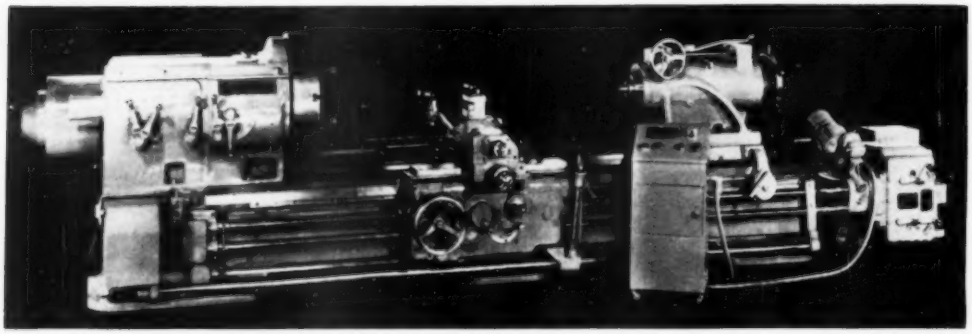
IT'S UNDERSTOOD that poor tool grinding is more prevalent than one would think, considering the educational efforts of the cutting-tool people and the business papers. Are you blaming the machine for chattering or the tools for poor performance, without checking up on who does the tool grinding in your plant? No tool can work well if mis-ground.

Truckin' on Down

WE DON'T KNOW whether the idea came from that old dance step, truckin', but when the Hotel Sherman's College Inn at Chicago was faced with a problem of moving its bandstand on and off the dance floor, it turned to the power industrial truck for the answer. Yale & Towne's Worksaver tractor does the job in one of the most unusual applications we've yet run across.



New Shop Equipment



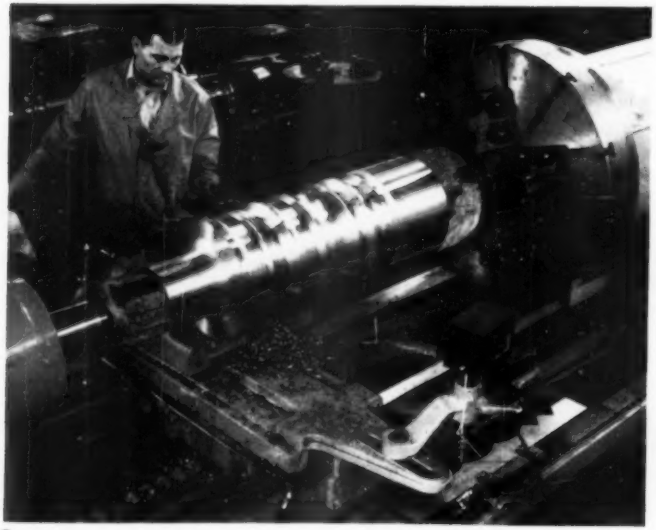
1 *Monarch Model NN, 32-in. swing. A 60-in. model will be produced this Fall. Equipped with electrical contouring unit, working from a templet and controlling both feed motions, this . . .*

Roll-Turning Lathe Is Tracer Controlled

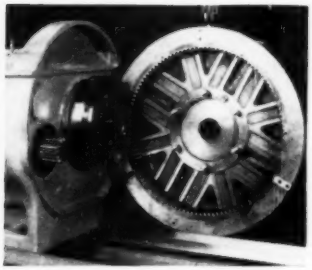
TRACER-CONTROLLED contour turning has ben applied for the first time to steel-mill rolls. Standard carbide tools contouring at speeds up to 110 sfpm replace the old HSS form tools and wedge-and-hammer feed in the new Monarch roll-turning lathe. Monarch-Keller electrical contouring controls are applied, with both carriage and tool-slide feeds operated through magnetic clutches. Tools are the recently developed insert type with cylindrical carbide tip, so a half-dozen tools will replace hundreds of form tools and cut machining time by two thirds on the toughest chilled-iron rolls. In operation the Keller unit gets its longitudinal feed to the carriage from the leadscrew and its cross travel to the toolslide from the crossfeed screw.

Headstock has two drives—16 fast speeds for carbide turning with a single-point tool, and eight slower speeds through the faceplate drive for form-tooling certain shapes. An interlock prevents their simultaneous engagement. Twenty-four spindle speeds range from $2\frac{1}{2}$ to 505 rpm, permitting exact cutting speed for particular diameter of roll. Headstock has no gearbox or end gearing because of electrically controlled feeds.

The heavy-duty tailstock design utilizes a $4\frac{7}{8}$-in. dia rotating quill mounted in precision anti-friction bearings. Connected to the tailstock end are the Keller controls, with an

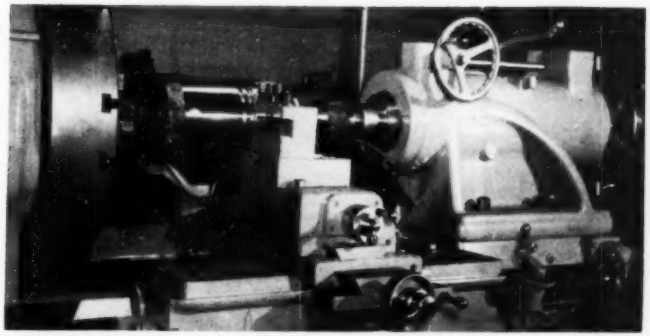


3 *Roll contour is controlled by tracer in foreground which operates both feeds*



4 *Gear next to spindle drives faceplate internal gear for slow-speed forming*

Materials and Parts



2 *Longitudinal and transverse tracer-controlled tool motions are screw-operated for positive feeding motions*

added rapid traverse mechanism permitting inching of cutting tool into position or moving it quickly from one end of the roll to the other. Rolls are turned on centers, permitting necks to be turned at the same setting. Necks can be redressed if not concentric during redressing operations.

The spindle has a 15-in. B-2 flanged nose. Size of the hole through the spindle is 2 3/16 in. Separate control can be provided at the apron for varying the speed of the dc drive motor to give desired spindle speed.

Headstock utilizes combined pump and splash lubrication with metered, filtered oil to bearings. A reservoir in the apron supplies automatic lubrication to all working apron parts, crossfeed screw, bearing of cross slide on carriage and bearing of carriage on bedways.

Specifications: swing over bed, 34½ in.; swing over cross slide, 18 in.; length between centers, in increments of 24 in., 60 to 324 in. The 32-in. Model NN engine lathe is recommended for use with a 30-hp 850/1700-rpm main-drive motor, providing a 2 to 1 ratio of infinitely variable speeds.

The Monarch Machine Tool Co., Sidney, Ohio

Plating-Rack Coating Protects Rack in Solutions

The Kote-Rax Grade K rack coating is designed to insulate and protect plating racks and figures in all types of electroplating and anodizing solutions. This formulation is said to have excellent chemical resistance and is free from any tendency to introduce organic impurities into bright plating solutions. Two dips are required to obtain a final coating. Surfaces should be clean and dry before application.

Hanson-Van Winkle-Munning Co., Matawan, N. J.

Formica's Laminated Plastic For Gears, Cams, Pinions

A laminated plastic is offered for gears, cams, pinions, bearings, and similar industrial applications. Known as RN-30, the plastic laminate is said to offer uniform mechanical strength, good machining, qualities and a smooth finish with good electrical properties. The new laminated plastic has uniform strength in all directions due to its matted, unwoven cotton fibers, distributed evenly throughout.

The smooth finish required for special mechanical and electrical applications, previously obtainable only in premium linen grades, is now offered at less cost in RN-30. The material can be machined, punched, turned, milled, drilled, threaded, and stamped. Minute teeth cut in small gears and fine clean edges on other pieces illustrate the punching qualities of the Formica laminated plastic.

The Formica Co., Cincinnati 32, Ohio

...INCLUDING

Micrometer attachment converts outside micrometers for internal use. Original accuracy maintained.....Page 138

Form grinder for irregular contours on edges of flat pieces is making 4000 parts per hr. Work is stacked in fixture, ground with crush-dressed wheel....Page 136

Gear hobber handles work to 6-in. dia. Speed, feed, and indexing are selected independently..Page 137

Tube-finishing machine deburrs, performs other operations on rod and tubes at 800 to 1200 per hr. .....Page 140

Surface grinder is sensitive for toolroom and small-parts work. Takes to 5-in. dia.....Page 142

Impact wrench handles studs, bolts, nuts, and capscrews to 2-in. size.....Page 144

Profile grinder, bench type, chucks wheels for high-speed work on irregular surfaces.....Page 146

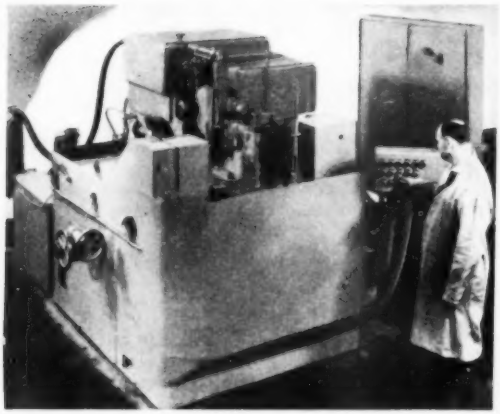
...and in JUNE 16

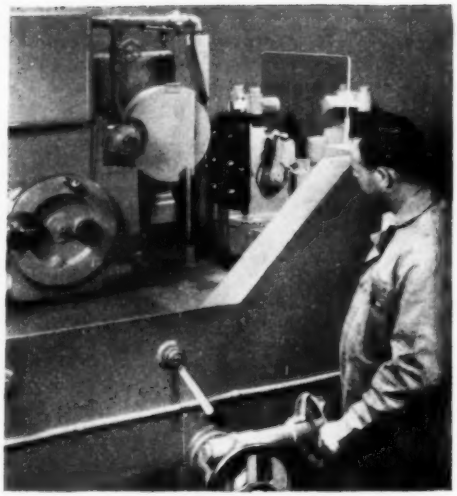
Coolant system for cutter grinder supplies thin stream of coolant to diamond wheel, returns mist to coolant tank.

Horizontal boring, drilling, and milling machine have automatic power positioning, doing away with jigs and fixtures.

Broach sharpener for internal and surface broaches feeds from tooth to tooth against a stop. Additional feed as diameter decreases is by micro-feed handwheel.

Thread roller has automatic hopper feed with notched clearing wheel. Produces 120 to 150 pieces per minute.





Rough edges of stamped lock parts are trued by crush-form grinding on the Truformatic at the rate of 4000 pcs per hr. The crusher roll, wheel and fixture are all aligned with respect to the work centerline in order to grind an accurate concave or convex form

Truformatic Grinds Edges of Stampings

Concave or convex forms of irregular contour are ground on the edges of flat pieces by the Truformatic. One of the first applications involves the making of auto-door parts at the rate of 4000 pcs per hr. In this case, the stamped articles are stacked in a fixture. The advantage of using a crush-formed wheel is that the sheared edge is trued to an accurate working surface, improving product quality and avoiding the need for making expensive shaving dies. About a dozen different parts are handled by means of appropriate fixtures and by mounting appropriate wheels and crushing rolls on the grinder.

Other parts that can be ground in the same manner are: thread chasers, textile, accounting and typewriter machine parts; gun and aircraft parts.

The Truformatic mounts an indexing table with two vertical fixture faces. While one fixture is in the grinding position, facing the wheel, the other fixture is in front of the operator, so that he may exchange it for a freshly loaded fixture. The fixtures illustrated hold about 160 stampings.

Alignment of work and wheel is established by a shoulder on the spindle in definite relationship to the worktable centerline. And the work fixtures are located with respect to the same centerline by means of keys in the worktable uprights. Also, the crusher roll on a stud behind the wheel is located with respect to the same datum.

The Truformatic is a single-pass machine. First, the wheelhead feeds forward to depth, against stops. Second, the table rises a preset stroke, and as it does the wheel grinds the form on the vertically stacked workpieces. Third, the wheelhead retracts. Fourth, the table returns to loading height and indexes.

Details of the automatic cycle are:

1. A fixture is loaded at the idle station facing the operator.
2. A button is pressed to start the cycle.
3. The worktable indexes 180°.
4. The wheelhead feeds to depth.

Stamped lock parts (right) are stacked in fixtures, usually 160 pcs per load, on the bench. At the machine the operator merely loads the fixtures into the machine and unloads

5. The worktable rises for its preset stroke (16 in. max., 3 in. min.) at any desired feed rate up to 15 in. per min.

6. At top stroke of the table, the wheelhead backs away.

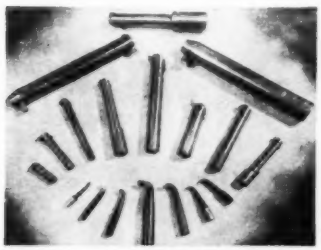
7. The table returns to the down position and indexes 180°.

The cycle does not repeat until the operator exchanges fixtures and presses the start button. About 25 cycles per hr are possible.

Although the Truformatic is a single-pass machine, it will remove up to 0.060 in. depending on the material and the contour. If parts require greater stock removal, the operations would be done in sequence after making changes in the wheelhead travel. In other words, the entire lot would be run through the machine two or more times. Such treatment is not necessary for the lock parts, because the problem here is merely to remove the rough fractured edge arising from the break that follows punch penetration.

General specifications are: maximum width of wheel, 2½ in.; floorspace, 96 by 144 in.; weight 10,000 lb. The separate coolant pump has a capacity of 200 gal.

Thompson Grinder Company, Springfield, Ohio.



Forged Bits and Boring Bars Fit Any Standard Toolholder

A line of forged bits and boring bars will fit any standard toolholder and are available for use in boring, facing, recessing and other similar operations. Fabricated of 18-4-1 high-speed steel, the forged bits can be furnished from stock in a wide range of sizes, not only in shank dimensions, but also in maximum boring depths.

Forged bits are available on order in shank sizes from ⅜ to 1 in. in increments of ⅛ in. They can be furnished having a minimum boring capacity of ¼ in. for the ⅜-in. shank size and are proportionately the same for other shank sizes. In addition, tools offer a selection of maximum depths for each of the various shank sizes as well as minimum boring diameters.

Boring bars which are made from alloy tool steel are available having shank sizes from ½ to 1½ in. in increments of ¼ in. They can be furnished having either straight or angular insertable bits. The standard cutter angle is 60°. Tools are also available with cutter angles of 45°.

Boring-bar sizes are similar to the line of forged bits in that they can be furnished in a wide variety of minimum bore and maximum depths.

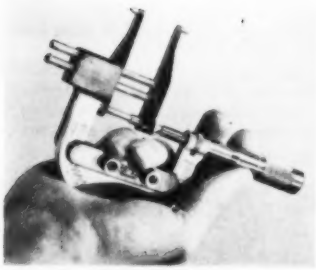
The Maxwell Co., 300 Broadway, Bedford, Ohio

Hamilton Gear Hobber Handles Small Spur, Spiral, Bevel Gears

The Hamilton No. 1 gear hobber, hobs small spur, spiral, and bevel gears on fast production schedules, and handles work from 0.050 to 6 in. OD. It delivers 12 hob speeds from 109 rpm to 1259 rpm. Hob spindle turntable swivels 105° to the left and 135° to the right. The machine affords helix leads from 0.800 to 130 in. and operates on a 1-hp motor.

Speed, feed and indexing can be selected independently. This adds flexibility to the machine making possible quick selection of a speed and feed to suit any material being worked and any size gear being hobbed. Alignment and trueness of work in hob spindles are held to within 0.0002 in.

Hamilton Tool Co., Hanover at Ninth, Hamilton, Ohio



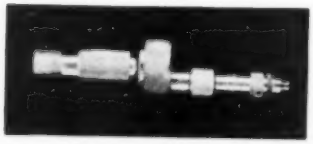
Outside-Micrometer Attachment Permits Internal Measurements

The improved-model Microdapter is an attachment for outside micrometers that permits taking precision internal measurements. Measuring points are cone shaped, and project beyond each leg. They reach into internal grooves, recesses, behind shoulders and in deep bores. The attachment clamps securely to any micrometer frame and measurements are read directly on the regular thimble with original micrometer accuracy.

A preset zeroing adjustment matches distance between tips with micrometer opening. Microdapters are available in stock sizes for 1-in. mikes covering a range of ½ to 1 in.; 2-in. mikes covering 1 to 2 in.; and for 3-in. mikes covering 2 to 3 in. Other sizes and special tip shapes can be furnished.

The Microdapter has been improved in method of mounting on the micrometer frame and in location of the zero adjustment. Clamping bars have been added which simplify attachment and add to rigidity.

Rimat Machine Tool Co., 1117 Air Way, Glendale, Calif.



Wyco Step-Up Handpiece Increases Speed Three Times

The Wyco 1300 step-up handpiece can be used with any Wyco flexible-shaft machine, except the Junior and Wycoflex models. By replacing the standard handpiece or anglehead with this step-up handpiece, the speed is increased three times.

Standard 3600-rpm single-speed Wyco flexible-shafts or machines can be used with small-diameter rotary files, mounted grinding wheels or abrasive sanders with a speed of 18,000 rpm. The handpiece is available in two sizes to fit the various Wyco flexible shafts. A special machine having a constant speed of 11,000 rpm giving 33,000 rpm by using this handpiece for carbide cutters with ¼- or ⅛-in. shanks is now available.

Wyzenbeek & Staff, Inc., 838 W. Hubbard St., Chicago 22, Ill.

Electronic Voltage Regulator Is a 500-va Instantaneous Model

Stabiline Type IE51005 is a 500-va instantaneous electronic voltage regulator. Input voltage range is given as 95-135 v. Output voltage range is said to be adjustable between 110 and 120 v. Rated output of the model is stated as 0-500 va; frequency in cycles is 60, ±10%. Recovery time is from 3 to 6 cycles.

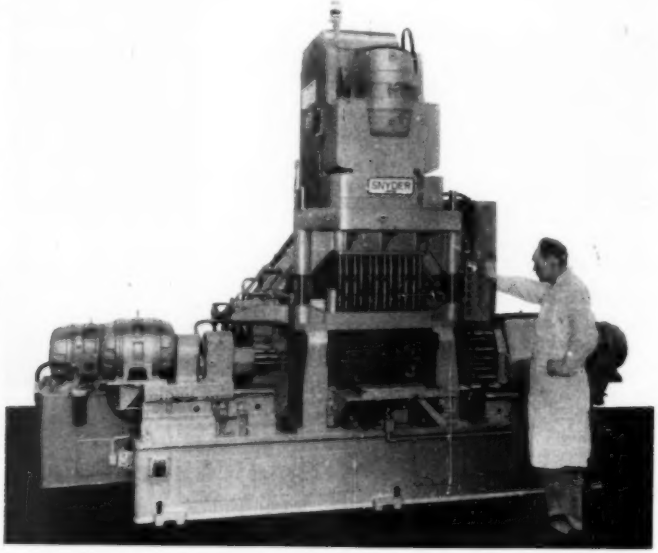
Load power factor range is 0.5 lagging to 0.9 leading and waveform distortion is said not to exceed 3%. All tubes but one in the unit are of standard manufacture. The special tube, while being built to specifications, is said to be available from a well-known manufacturer.

The Superior Electric Co., 79 Hannon Ave., Bristol, Conn.

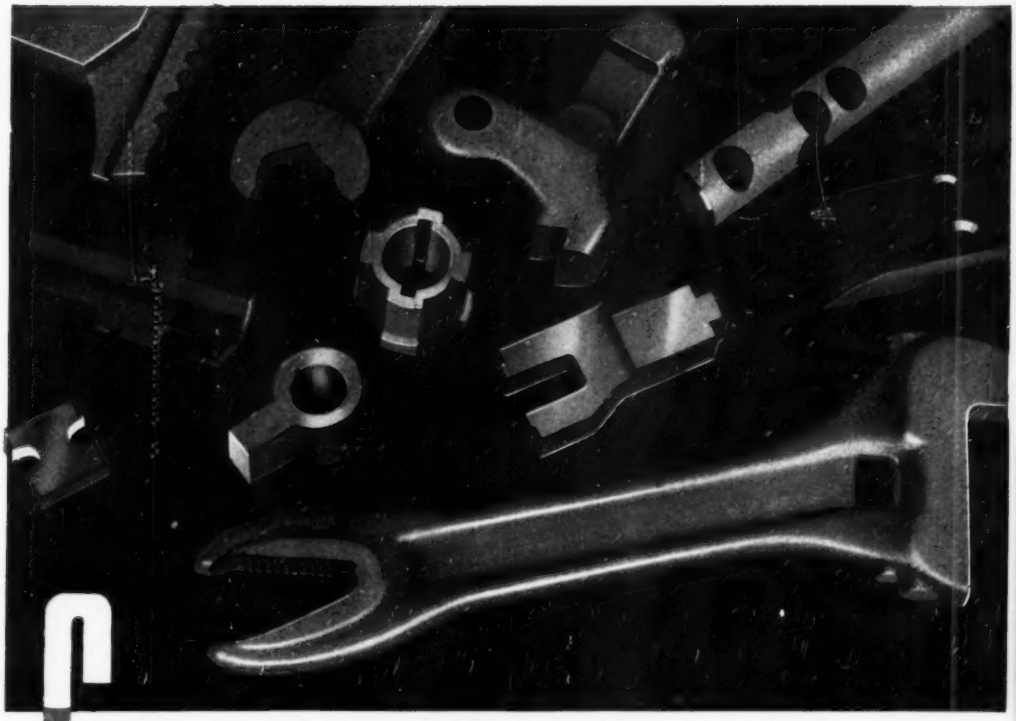
Uniform Tungsten Powders Are Offered for Carbide Tools

Fine tungsten powders are introduced with precise and predictable particle size and distribution for the critical requirements of tungsten-carbide toolmakers. This new method of production makes it possible to supply material to meet toolmakers' exact specifications without varying the processing.

Sylvania Electric Products Inc., Towanda, Pa.



AUTOMATIC SPECIAL-PURPOSE MACHINE processes 32 holes every 45 sec in a 6-cylinder, cast-iron alloy block. The three-way machine features hydraulic clamping and an automatic work cycle. Process comprises counterboring 6 exhaust-valve insert holes, taper reaming 6 inlet-valve passages from top, counterboring one hole for Welch plug, countersinking two holes in the rear end of the block and countersinking 17 holes in front end of block. High-speed steel tools are used at speeds ranging from 60 to 90 sfpm—*Snyder Tool & Engineering Co., Detroit, Mich.*



CONTOURS - *Simple* OR *Intricate*

are Broached faster . . . for less

Increased production and uniformity of shape and tolerance are two of the most important advantages of contour broaching. Another is the consistently good surface finish created by broaching . . . in most applications it is suitable for final assembly.

In addition, there are great savings in tooling costs and maintenance. All but the simplest forms are broached progressively by a series of broach inserts, each of which produces a part of the contour. This progressive-type tooling eliminates the expense of costly tools having the complete form. Further, because each insert has but the simplest form, usually round or flat, the cost of tool sharpening is greatly reduced. In the event that one insert is damaged, only that section need be replaced. Idle machine time is cut, too, because simple design increases tool life.

Shown above are but a few broached contours of the hundreds for which Detroit Broach has designed and built the tooling. We will gladly outline the advantages of broaching the contours of your parts . . . and give you cost and production data for each. Call your local Detroit Broach representative or write today.

DETROIT *Broach* COMPANY

20201 SHERWOOD AVENUE
DETROIT 12, MICHIGAN

Adjustable Crowfoot Attachments Offered in Two Square-Drive Sizes

Adjustable crowfoot attachments are said to combine through the medium of one tool, the flexibility of the detachable socket system with the advantages of the open-end adjustable wrench. The adjustable crowfoot attachment, when used with numerous handles and parts available, presents a variety of combinations. They are made from selected alloy steel in two square-drive sizes, $\frac{3}{8}$ and 12 in., with capacities of $\frac{3}{4}$, and 15/16 in. respectively. Square shoulders on the body portion of the sliding jaw provide maximum and positive bearing against working stress.

J. H. Williams & Co., 400 Vulcan St., Buffalo 7, N. Y.

Air-Operated Collet Frees Hands On Second-Operation Machine

This Model AC59 high-speed precision second-operation machine offers an air-operated collet. In operation, the machine operator closes and opens the collet by actuating a pedal as shown in the illustration. The pedal opens and closes an air valve which instantly operates the collet.

Foot control of the collet leaves the operator's hands free to do production work of loading and unloading, and feeding cutting toolslides. The collet is said to accurately hold work without distortion, even though there is considerable variation in the chucking diameter from one piece to another.

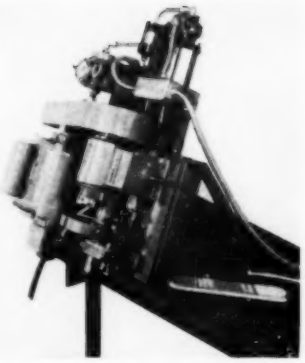
The standard 5C Hardinge collet or step chuck can be closed or opened with the spindle at rest, or at any speed to 4000 rpm. The preloaded ball-bearing centerdrive headstock spindle offers 1-in. round, $\frac{7}{8}$-in. hexagon and $\frac{3}{4}$-in. square collet capacity. Step chuck capacity is 6 in. Eight spindle speeds are available in either forward or reverse direction from 250 to 4000 rpm. Three other speed ranges are available for varied production requirements.

Hardinge Bros. Inc., Elmira, N. Y.

Oil-, Grease-Proof Light Offers Built-in Outlet in Handle

This 5025 portable service light offers an outlet built into the molded Bakelite handle. The outlet serves as a convenient plug for power tools, soldering irons, or additional lights. The service light is equipped with 25 ft of vinyl thermoplastic cord and plug which, in combination with the Bakelite handle provides a unit which is 100% oil, grease and moisture proof. The plastic cord will not become brittle with age. The handle is fitted with a plated steel cage to protect the light bulb from breaking. It is available with or without a reflector.

The McGill Mfg. Co, Inc., Electrical Div., Valparaiso, Ind.



Tube, Rod End-Finishing Machine Features Automatic Air Operation

Automatic air operation is now available for simplified high-speed tube deburring and other end-finishing operations on the Series 600 tube-end rod and finishing machine. The small bench-model machine uses a foot-switch operated air cylinder with Hydro-check control to leave operators' hands free to handle work up to 2 in. in diameter at production speeds of 800 to 1200 tube ends per hr.

Vertical mounting base is available as an optional accessory permitting gravity unloading of short pieces. A selection of eight spindle speeds is obtained from the step-sheeve V-belt drive to secure maximum tool efficiency for any work diameter within the 2-in. maximum range of the machine.

Tooling can be furnished for other end-finishing operations such as center drilling, rod chamfering, drilling, reaming, pointing, and boring in addition to tube deburring. The high degree of flexibility is indicated by the 60 sec change-over time of the replaceable chuck jaw inserts and threaded toolholder to fit work diameter.

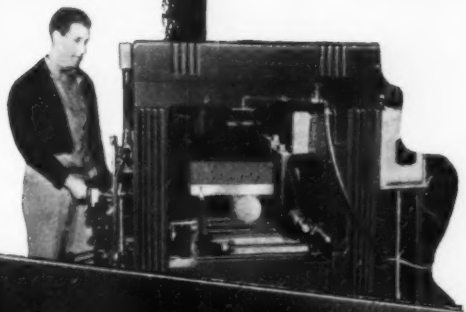
Pines Engineering Company, Inc., Aurora, Ill.

Micro-Keen Special Form Tools

A wide range of special form tools called the Micro-Keen Series are made of Carbalt high-speed steel, and said to increase the output and reduce cost of automatic screw-machine products. Accurate grinding of special profiles and forms on circular and flat tools, counterbores, reamers, recessing tools, flat drills, punches, rolls and heading dies is offered.

Johns-Hartford Tool Co., Box 314, Hartford, Conn.

ATKINS *Announces*



THE ATKINS

Silver-Flash

POWER HACKSAW BLADE

Twenty-five years ago Atkins introduced the first high speed steel hacksaws made in the United States, and today in their field Atkins "Silver Steel" Hacksaws still are the very best blades made . . . excellent for sawing any of the high-carbon tough jobs or any other steels that can be cut with hacksaws.

In the field of sawing lower alloy steels, where high production cutting is essential, the ATKINS SILVER FLASH rounds out the Atkins line of blades that covers every type of hacksaw requirements.

ATKINS SILVER FLASH is the product of years of metallurgical research, resulting in the development of new methods of manufacturing and heat treating.

ATKINS SILVER FLASH is a tough, yet exceptionally flexible blade. It reduces blade breakage to a minimum. Its teeth stay sharp longer with little chipping. Resistance to abrasive action is excellent.

ATKINS SILVER FLASH cuts fast and clean to extremely close tolerances. ATKINS SILVER FLASH reduces costs due to longer blade life.

Find out what ATKINS SILVER FLASH can do for you. Ask your Industrial Distributor to demonstrate the new ATKINS SILVER FLASH performance on your own cutting jobs. Get in touch with him today.

LOOK at these Typical Atkins *Silver-Flash* Performance Reports

SF614 P SF 4714	249 pcs. 1" rd. SAE 4140 8 machines, 1 blade ea. 35,000 sq. in. 4½" sq. 1045
SF 6718	9 hrs. continuous cutting stainless steel

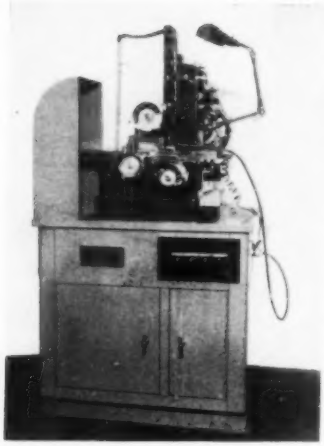
ATKINS SILVER FLASH Power Hacksaw Blades are packaged 10 to a box. Available in all standard lengths and tooth sizes.

ATKINS

E. C. ATKINS AND COMPANY • *Home Office and Factory:* 402 South Illinois Street, Indianapolis 9, Indiana *Branch Factory:* Portland, Oregon • *Branch Offices:* Atlanta • Chicago • Los Angeles • New Orleans • New York • San Francisco

AAA TRADE MARK ATKINS "ATKINS ALWAYS AHEAD"

MAKERS OF BETTER SAWS FOR EVERY CUTTING JOB

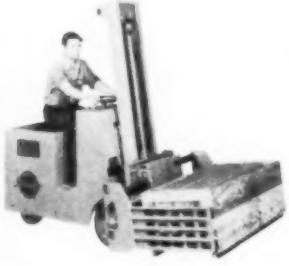


Sensitive Surface Grinder Handles Small-Parts Operations

A sensitive surface grinder is designed for toolmakers and small-parts grinding. Variable wheel speeds give maximum flexibility. Diameters from 1/16 to 5 in. or more can be handled. Coolant can be thrown on the work from almost any angle.

The grinder is said to be sensitive enough to split tenths, yet can be used for heavy roughing.

Jakobsen Tool Co., 223 Glenwood Ave., Bloomfield, N. J.



Baker Clamp Truck Speeds Handling of Bulky Items

The Baker clamp truck utilizes hydraulically operated clamp arms to grip the load for lifting and transporting. Materials handling is speeded because need for loading onto skids or pallets or for adjusting grabs, hooks and slings prior to moving is eliminated. The clamp is of all-welded-steel construction with dual double-acting hydraulic cylinders. It is mounted on the truck lift carriage with control valve mounted in operator's compartment. Connecting hydraulic lines are high-pressure hydraulic hose clipped to lift chains.

The hydraulic system of the truck supplies the oil under pressure to the clamp cylinders. Initial movement of the control lever closes the switch which in turn closes the contactor to start motor. The clamp can be mounted on Baker Type FRH or Type FAH trucks. The weight of the clamp and the fact that the load is 5 in. farther away from the drive wheels both reduce the capacity of the truck. The total length of the clamp is 36 in. Length of clamp arms is 31 in.; width of arms, 12 in.; net weight, 550 lb.

Baker Industrial Truck Div., The Baker-Raulang Co., 2168 W. 25th St., Cleveland 13, Ohio

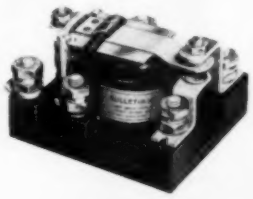
Cam-Operated Control Valve Added to Modernair Series

Additions to the CV control-valve series include a cam-operated model and a foot-controlled valve with spring-return action. The foot-operated valve permits close-to-the-floor operation. The CV series is specially designed for the control of single- and double-acting cylinders in pneumatic or fluid circuits. The valve piston is balanced, eliminating handle load from pressure, and design permits transmission of full line volume and pressure through valve.

Identical housing assembly for all models in the same pipe size permits hand, foot, cam, electricity or pressure pilot operation and, in most instances, conversion from one to the other without breaking line connections or dismounting valve.

Automatic and semi-automatic sequences can be secured with either spring or pressure pilot actuation. Body is made from aluminum alloy. Seals may be replaced without removing valve from piping. Valves are available in $\frac{3}{8}$- and $\frac{3}{4}$-in. 18-port sizes.

Modernair Corp., 4222 Hollis St., Oakland 8, Calif.



Magnetically Operated Relays Suitable for Remote Control Use

Bulletin 103 Aircraft Power Type Relays are magnetically operated and are suitable for remote- and automatic-control purposes where conditions of vibration and shock are encountered. Basic parts are mounted on a molded phenolic base with front-connected post-type terminal inserts. Contact gap, tail spring and normally closed contacts are adjustable. Dc relays withstand acceleration tests above 10g and vibrations of 60 cycles and 1/32-in. amplitude.

Ward Leonard Electric Co., Mount Vernon, N. Y.

Air, Water Hydraulic Cylinders Feature Tie-Rodless Construction

Cylinders, operated with air, water, or hydraulic power feature simplified construction. They are available in bore sizes from $1\frac{1}{2}$ to 8 in. covering between 80 and 90% of cylinder requirements in industry. Tie-rodless construction permits compact design; for example, unit with a 6-in. bore cylinder is said to occupy no more space than a 4-in. bore unit of conventional design. Operation of the unit is guaranteed to 1500 cycles per min continuous duty. The cylinders have self-aligning and regulating or adjustable cushions for either or both ends and are applied without adding to the overall mounting dimensions.

Ortman-Miller Machine Co. Inc., Hammond, Ind.

ALL STEELWELD SHEARS
CONTROLLED ELECTRICALLY...

OPERATION of Steelweld Shears is unusually easy and convenient. There is no tiresome lifting of the leg to work a foot treadle. Slow, fatiguing knee action has been replaced by fast easy toe action.

A safety type electric foot switch is used. It can be slid around the floor wherever most convenient. It enables shearing speeds not attainable with foot treadles for certain cutting operations.

For instance, when cutting narrow strips from a long sheet, the operator can push the sheet at the end and control the shear at the same time. He need not be near the machine. As the sheet becomes shorter he can move the switch along with his foot to always be within easy reach.

There is no extra charge for electrical foot control on Steelweld Shears — it is standard equipment on all size machines.

Steelweld Shears are radically different from all other shears with many outstanding features. Get the facts on these truly new and modern machines. Learn about the advantages they offer you.

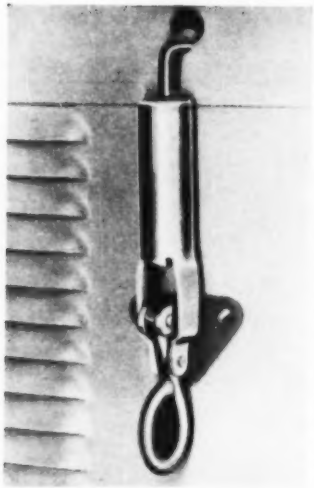
GET THIS BOOK!

CATALOG No. 2011 gives construction and engineering details. Profusely illustrated.

THE CLEVELAND CRANE & ENGINEERING CO.

1403 EAST 282nd STREET • WICKLIFFE, OHIO

STEELWELD PIVOTED BLADE SHEARS



Spring-Loaded Hood Fastener Holds Sheet-Metal Flaps Closed

A heavy-duty spring-loaded fastener holds sheet-metal flaps, panels and hoods closed. The hood latch was designed originally for engine hoods but has a wide application in the field for air-conditioning ducts, removable panels on heavy-duty machinery, etc. Weighing approximately 10 oz and measuring 7 in. in length, the hood latch has a take-up of 7/16 in. and retains, in closed position, approximately 40- to 50-lb tension. Three rivets hold the fastener in place.

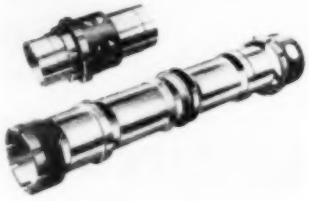
Donaldson Co., 666 Pelham Blvd., St. Paul, Minn.

Large-Capacity Air Impact Wrench Handles Nuts to 2-in. Bolt Size

Large-capacity air impact wrench reduces time required for repairing heavy equipment. In the scheduled tear down of a rolling mill where down time was charged at $10 per min, the size 577 impact wrench cut the time on a 4-hr hand job to 1½ hr, saving $1500 on down time charges. The wrench is designed to handle large studs, bolts, nuts and capscrews from 1¼- to 2-in. thread size.

The wrench operates on the rotary impact principle by which motor torque is converted into 1000 powerful rotary impact blows per min. It is especially valuable for removing rusted or frozen nuts and for drawing nuts and capscrews tight. The wrench weighs 72 lb, using magnesium extensively in the housings. Over-all length to shoulder of square drive is 24½ in. Side to center distance of hammer case is 2 13/16 in.; rated capacity, 2-in. bolt size. Free speed is 535 to 565 rpm.

Ingersoll Rand Company, Phillipsburg, N. J.



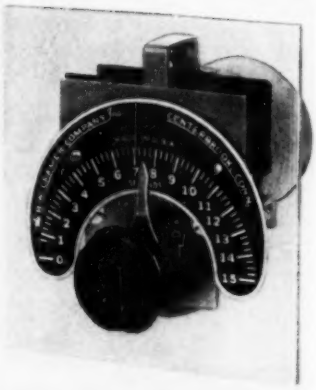
Single-Thread Tube Unions Made in Steel or Aluminum Alloy

A lightweight, quick-connecting tube union is offered for joining flared tubing. The union, known as the 1900 Series, is designed to meet the need for a lighter-weight connection in fluid lines where heavy fittings and close line spacing has created weight problems and excessive maintenance costs.

The 1900 Series union consists of five parts comprising a metal seal ring, two sleeves, a threaded clamp ring, and the mating coupling nut. The coupling nut incorporates visual inspection ports which further lighten the unit. Fast assembly is achieved by the single threaded connection which is designed for use with standard commercial spanner wrenches.

The Series is available in 1½- to 2½-, and 3- and 4-in. sizes in either steel or aluminum-alloy material. The 1900 Series coupling is claimed to represent a weight saving of 1½ lb, in the 1½-in. size in steel.

Roslyn Inc., 718 W. Wilson Ave., Glendale 3, Calif.



Type IG Interval Timer Designed Without External Housings

The Type IG interval timer is designed for use when electrical equipment is to be manually turned on, run for a preset time, and stopped automatically. It operates one or two single-pole, double-throw switches and returns to original position at the end of a pre-determined time interval.

The Type IG timers without external housings are especially made for built-in applications in microfilming equipment and other machinery. A precision-built self-starting synchronous motor operates an inclosed, dust-type snap switch through a cam and actuating arm. Manual setting of pointer closes the motor circuit and starts the timing.

A wide range of control for a variety of applications is made possible by eleven different time ranges, from 15 sec to 24 hr. The unit is available in 6, 12, 24, 115 and 230 volts.

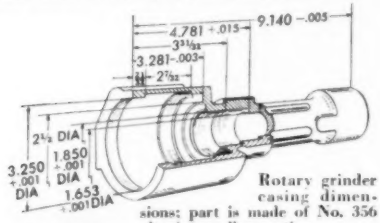
The R. W. Cramer Co., Inc., Centerbrook, Conn.

Three Special Abrasive Compounds For Lapping Brass Plug Valves

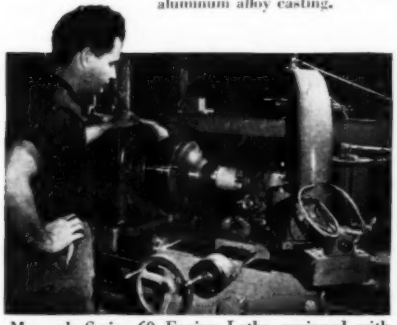
Three different grades of abrasive compounds have been developed specifically for use in grinding and lapping-in brass or bronze tapered plug or key cock valves. Compounds are made with a water-soluble base claimed to possess good lubricating and carrying qualities. Parts finished with this compound can be washed in ordinary water. It is made in the grades No. 17 coarse, 18 medium, and 19 fine.

United States Products Co., 518 Melwood St., Pittsburgh 13, Pa.

Battery of 3 Monarch Series 60 Engine Lathes, "Air-Gage Tracer"-equipped, producing rotary grinder casings in the Cleco Division plant of the Reed Roller Bit Company, Houston, Texas.



Rotary grinder casing dimensions; part is made of No. 356 aluminum alloy casting.



Monarch Series 60 Engine Lathe equipped with "Air-Gage Tracer", turning rotary grinder cases at Reed Roller Bit Company. Operations include rough and finish inside diameters, faces, chamfers, undercuts and reliefs. Cemented carbide tools used.

Picture of
PRODUCTION
3.75 times faster

Air-Gage Tracing has cut 16.42 minutes off the time for machining these rotary grinder cases. On a turret lathe they took 22.42 minutes each; now they're roughed and finished in a total of 3.70 minutes—and handling and gauging time adds another 2.30 minutes—6.00 minutes in all, complete!

There's a saving on tools and tool sharpening, too. On the turret lathe, hand reaming was necessary, using four reamers. The "Air-Gage Tracer"-equipped Monarch Series 60 Lathe does the job with such accuracy and fine finish that no reaming is needed.

For similar savings in your own contour turning, boring and facing—or step shaft production, investigate the stepless, single tool Monarch "Air-Gage Tracer" attachment. It is applicable as factory equipment on all lathes in the Monarch line.
Ask for Bulletin 2604.

ACCURACY · ECONOMY · LONG LIFE
Monarch
TURNING MACHINES

THE MONARCH MACHINE TOOL CO., Sidney, Ohio

FOR A GOOD TURN *FASTER*—TURN TO MONARCH

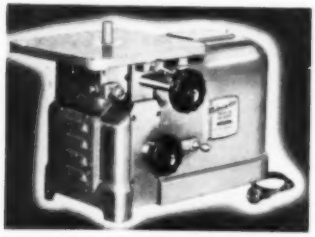
Contact Meter Responds to Changes of ½ Micro-Amp

A meter relay is offered for control applications. Positive contact on changes in current or voltage of as little as ½ micro-amp or a fraction of a millivolt is claimed. Contact point is adjustable over the entire scale arc.

Relays consist of standard indicating type meters with adjustable Micro-Contacts. One platinum contact is carried on the pivoted moving element and is connected in series with an extra winding on the moving element. The other contact, also platinum, is mounted on the handset red pointer. Current in the contact circuit flows through the extra winding and locks the contacts together electromagnetically.

Contacts may be separated by interrupting the current flow in this circuit, either manually or by an automatic interrupter. Micro Contact meters have been used for automatic temperature-control pyrometers. In electronic equipment present meters can be replaced with these contact meters providing automatic checks on operation in all circuits.

Assembly Products, Inc., Chagrin Falls, Ohio



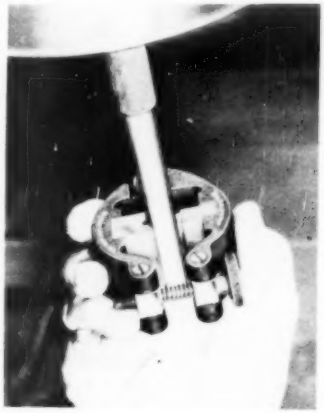
Profile Grinder Handles Internal, External Contours

The bench-type profile grinder, designed primarily for high-speed precision grinding of internal and external contours, curved, odd and irregular surfaces, is adaptable to the grinding of die clearances, sharpening cutter dies and punches, grinding cams and finishing hardened-steel parts.

A collet chuck permits easy removal and insertion of grinding wheels and provides absolute true running of wheels. The built-in diamond wheel dresser is offered to keep wheels sharp and true. Also included is a compound tilting mechanism which tilts the worktable 30° to front and 15° to side and permits a wide range in grinding compound curves and angles.

A vertical adjustment of 3¼ in. permits using and dressing mounted wheels to this height. Two models, standard and high speed for mounted stone and high-speed carbide wheels respectively, differ only in spindle speed.

Rice Pump & Machine Co., 1025-B S. 40th St., Milwaukee 4, Wis.



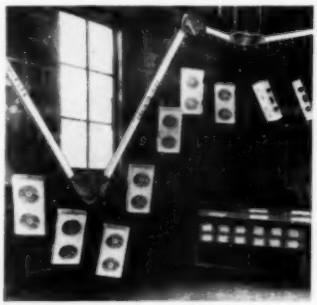
Delapena External Hone Produces Precision External Diameters

The Delapena external hone produces precision external diameters quickly and cheaply. The hone is designed to correct ovality, remove taper, and produce micro-finishes. The external hone, of simple design, consists of a body member into which is readily fitted one of a series of guide blocks, together with stone holders to suit the diameter of the work to be honed.

The body member consists of two hinged parts which are held apart by a spring against an adjustable stop or control screw. Three types of stones are supplied for the honing of work; namely, roughing, finishing and polishing stones. The stones are mounted on holders which may be mounted in the hone body.

In order to insure proper alignment of the honing stone with respect to the guide block, a truing stick is provided. A complete range of Delapena external honing equipment, covering all diameters between 1/16 and 1 in., is carried in stock with replacement parts for all sets.

Motch and Merryweather Machinery Co., 715 Penton Bldg., Cleveland 13, Ohio; representative for Delapena & Son, Ltd., Cheltenham, England.



Overhead Conveyor Handles Constant Flow of Materials

Chain-O-Flex is a flexible-chain-conveyor packaged product for use where a constant flow of material or assembled products is needed. Quick assembly of any practical conveyor-system pattern is featured. All parts are bolted together like an Erector set. All corners are highly flexible and adjustable to desired degree.

Variable speeds are obtained by adjusting the band wheel on the drive unit which will provide a 3 to 1 speed ratio. Multiple drive units may be used on extremely long Chain-O-Flex systems.

Chain-O-Flex Corp., Franklin Park, Ill.; distributed by Industrial Equipment Company, 315 N. Ada St., Chicago 7, Ill.

Crothane Dielectric Material Can be Pressed, Extruded

Crothane, a dielectric material, can be supplied in flat plates or in tubes, held to an OD or ID ±0.0015 in. at no extra cost. Starting with a powdered raw material, Crothane can be pressed and extruded to shape as well as machined with high-speed tools. It is especially suitable as a substitute for paper tubes. Depending on the grade used, power factor ranges from 2.8 to 3%, while the dielectric constant ranges from 2.6 to 3.8.

Henry L. Crowley & Co. Inc., 1 Central Ave., West Orange, N. J.

Another outstanding J&L development—

"E"

J&L FREE-CUTTING STEEL

J&L STEEL

A New Bessemer Screw Stock with Proved Machinability Ratings as High as 170!

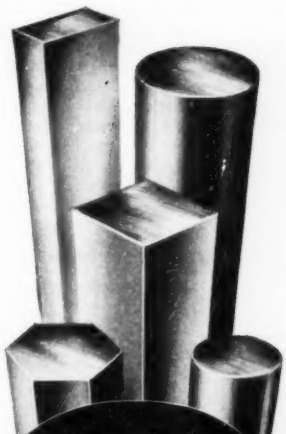
- **Backed by 50 years of leadership in the field of free-machining, cold-finished steels.**
- **Proved by exhaustive field testing.**

Forty-five independent machine shops, throughout the metal-working industry, have tested over *6,100 tons* of J&L "E" Steel in more than 100 applications. These shops report:

- **Better Machine Finish**
- **Longer Tool Life**
- **Higher Speeds**
- **Machinability Ratings up to 170**
- **Better Response to Forming and Cold Work**
- **Higher Magnetic Permeability**

For 50 years J&L has led in the development of free-cutting, cold-finished steels—both bessemer and open-hearth. Every new J&L steel introduced in this field has been a major contribution toward the lowering of the unit cost of machined steel parts. *Now we offer you J&L "E", a bessemer grade steel with distinctly greater free-cutting efficiency.*

You will want complete information on this latest J&L steel development. Let us discuss the money-saving possibilities of J&L "E" Steel with you. The coupon is for your convenience.



All standard sizes and shapes are available.

J&L "E" Free-Cutting Steel is made in *three* grades: E-15, E-23 and E-33, each within the composition limits of the standard bessemer screw steels and with similar tensile properties. Note the following equivalents:

E-15—equivalent standard grade, B-1111
E-23—equivalent standard grade, B-1112
E-33—equivalent standard grade, B-1113

Jones & Laughlin Steel Corporation
402 Jones & Laughlin Building
Pittsburgh 19, Pa.

I should like to have more information on J&L "E" Free-Cutting Bessemer Screw Stock. Please have your representative call.

NAME_____

TITLE_____

COMPANY_____

ADDRESS_____

JONES & LAUGHLIN STEEL CORPORATION

From its own raw materials, J&L manufactures a full line of carbon steel products, as well as certain products in OTISCOLOY *and* JALLOY *(hi-tensile steels).*

PRINCIPAL PRODUCTS: HOT ROLLED AND COLD FINISHED BARS AND SHAPES • STRUCTURAL SHAPES • HOT AND COLD ROLLED STRIP AND SHEETS • TUBULAR, WIRE AND TIN MILL PRODUCTS • "PRECISIONBILT" WIRE ROPE • COAL CHEMICALS

V-Type 4-Cylinder Compressor For Stationary-Type Installations

A V-type, four-cylinder air compressor offers a floating-type tank mount, and an enlarged and refined cooling system. Employing a two-stage principle in both banks of cylinders, the displacement of a 10-hp unit, for example, is 47.86 cfm at 175 psi.

Similar high displacement is attained in the 15-hp and 7½-hp models, all of which are available for 175-psi or 125-psi use. The compressors are available to operate from all common electrical currents and are supplied to meet code requirements of different cities and states.

The DeVilbiss Co., 300 Phillips Ave., Toledo 1, Ohio

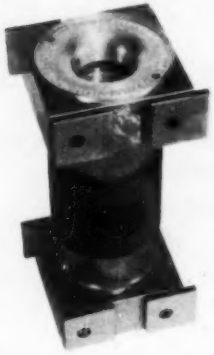
Copper-Oxide Battery Charger Energizes Industrial Trucks

The Rectox copper-oxide battery charger is suited for on-the-spot charging of industrial-truck batteries. The battery features the saturable reactor control, providing smooth adjustment at output by variation of inductance.

The use of a rheostat control which can be adjusted while energized eliminates the necessity of constant changing of taps for high-rate, low-rate, aging and line-voltage variation. Charging cycle is automatic after preliminary selection of the rate by the turn of a dial.

The Rectox charger can be obtained as a combination unit to charge either lead-acid, or nickel-alkaline batteries. Either type can be charged in less than 8 hr. With the addition of a plug-in charge control panel, change from a nickel-el-alkaline charger to a lead-acid charger can be made in the field.

Westinghouse Electric Corp., P.O. Box 868, Pittsburgh 30, Pa.



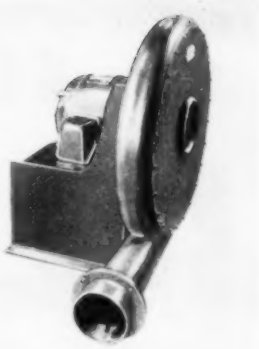
Precision Plumb-Level Graduated in 0.0005 in. per ft

Two Fell precision-level glasses are used in this tool; one for horizontal leveling and one for vertical or plumb. Glasses are graduated in 0.0005-in. per ft. spaces both ways, giving a quick and accurate way to square vertical parts of a machine with the horizontal parts, and telling the amount of lean in any direction.

There is no chance of error because bubble readings are self checking by turning the tool halfway around. Bubbles flow in ethyl ether and are sensitive to the slightest change in level.

Graduation lines form squares about the circular bubble enabling user to see the amount of variation from level in any direction. Size is 5x5x12 in.; glasses are 2⅜ in. in diameter by ½ in. thick. The bubble is 1 5/16 in. in diameter. The movable corner plate fits against the 90° corner of a vertical surface. Special plates can be furnished to fit other angles.

Wm. B. Fell Co., 320 McLain Ave., Rockford, Ill.



Lindberg-Fisher Blowers, Feature 360° Positioning

An improved line of single-stage centrifugal blowers feature full 360° positioning of the air outlet. This facilitates installation and eliminates pipe cutting, welding and extra piping. Belt-driven blowers have been designed to utilize approximately one-half the floor space normally required.

Lindberg Engineering Co., Air and Hydraulic Div., 2444 West Hubbard St., Chicago 12, Ill.

Three-Tiered Movable Table Made of 16-, 18-gage Sheet Steel

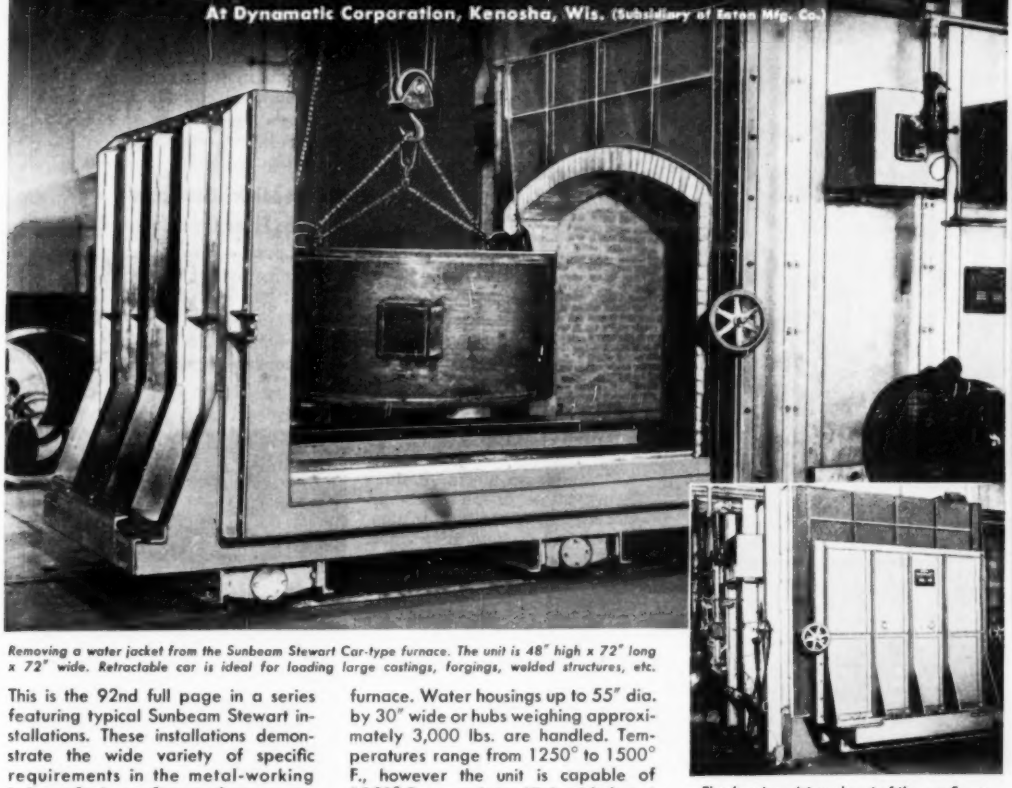
The Tote'em table is a three-tiered movable table made of 16- and 18-gage sheet steel, and used for moving tool supplies or for stockroom use. Shelves of the table are 16x22 in. and have a 1-in. protective flange. There are 12½ in. of space between each shelf, allowing room for stacking. The top shelf can be reversed to form a smooth tabletop without the flange.

Alhambra Products Co., 822 Date St., Alhambra, Calif.

No. 92 of a Series of Typical Installations

Sunbeam
STEWART
THE BEST INDUSTRIAL FURNACES MADE

FOR NORMALIZING WITH CAR-TYPE FURNACE
At Dynamatic Corporation, Kenosha, Wis. (Subsidiary of Eaton Mfg. Co.)



Removing a water jacket from the Sunbeam Stewart Car-type furnace. The unit is 48" high x 72" long x 72" wide. Retractable car is ideal for loading large castings, forgings, welded structures, etc.

This is the 92nd full page in a series featuring typical Sunbeam Stewart installations. These installations demonstrate the wide variety of specific requirements in the metal-working industry Sunbeam Stewart furnaces are designed to meet. Sound engineering and quality workmanship are behind this continuous record of delivered satisfaction.

To obtain more consistent, first quality heat treated work and overcome delays of assigning work to outside sources, Dynamatic Corporation installed a Sunbeam Stewart Car-type furnace. Water housings up to 55" dia. by 30" wide or hubs weighing approximately 3,000 lbs. are handled. Temperatures range from 1250° to 1500° F., however the unit is capable of 1850° F. operations. High nickel cast iron sand-seals give a perfect seal, eliminate excess heat loss and undue scaling.

It will pay to consult Sunbeam Stewart on your heat treating problems. Sunbeam Stewart builds a full line of standard furnaces, atmosphere and brazing, continuous conveyor units and galvanizing equipment.

The door is an integral part of the car. Saves time, reduces overhead space, and gives a better seal between door and furnace.

FREE ON REQUEST
SUNBEAM STEWART VEST POCKET HEAT TREATING DATA BOOK
Seventy-two pages of charts, tables, diagrams, factual data . . . ready reference book for all types of engineers. Write Sunbeam Stewart, Dept. 119, for your personal copy.

SUNBEAM STEWART INDUSTRIAL FURNACE DIVISION of SUNBEAM CORPORATION
(*Formerly* CHICAGO FLEXIBLE SHAFT CO.)

Main Office: Dept. 119 4433 Ogden Ave., Chicago 23—***New York Office:*** 322 W. 48th St., New York 19—***Detroit Office:*** 3049 E. Grand Blvd., Detroit
Canada Factory: 321 Weston Rd., So., Toronto 9

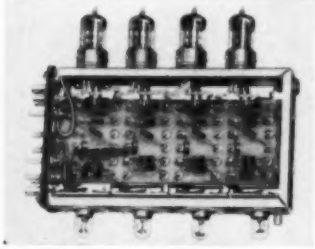
A letter, wire or 'phone call will promptly bring you information and details on SUNBEAM STEWART furnaces, either units for which plans are now ready or units especially designed to meet your needs. Or, if you prefer, a SUNBEAM STEWART engineer will be glad to call and discuss your heat treating problems with you.

Cole Blueprint Cabinet Contains Five Drawer Units

A blueprint cabinet is offered of heavy-gage furniture steel. The cabinet contains five gliding drawers on ball-bearing rollers, and five drawer units securely stacked to meet individual requirements.

Cabinets are also available with automatic plunger-type locks, controlling all five drawers. The lift compressor in the front of the drawer and the hood in the rear prevents the material filed from curling, creasing or tearing. Two sizes are available: one with inside drawer dimensions, 37x25x2½ in. high, and the larger with inside drawer dimensions of 43x32x 2¼ in. high, finished in olive green and Cole gray.

Cole Steel Equipment Co., 285 Madison Ave., New York, N. Y.



Electronic Counter Decades Count at Rates to 130,000 Per Sec

High-speed electronic counter decades which are used in the Potter standard counters, scalers, predetermined counters, and counter chronographs are now available separately. The simple counting circuit features a direct decimal readout (0-9) on four neon glow lamps which are designated 1-2-4-8. Readout is obtained without a complex resistor matrix.

The plug-in decade, illustrated, utilizes four type 12 AU7 tubes and can be used at counting rates up to 130,000 per sec with absolute accuracy. A number of decades may be connected in tandem to provide desired registration capacity. Predetermined counts are selected by means of a rotary selector switch which presets the complement of the desired number into the decade.

Potter Instrument Co. Inc., 136-56 Roosevelt Ave., Flushing, N. Y.

Flame-Failure Safeguard Handles Semi-Automatic, Manual Burners

The Fireye System FF-3 is offered for flame-failure protection of semi-automatic and manually ignited industrial oil burners. System FF-3 includes photoelectric scanner type 45PH5 and control type 24QJ5. The scanner consists of a phototube and vacuum tube amplifier housed in a dust-tight aluminum case.

The Fireye continuously monitors the oil flame, and when the flame fails, instantly signals the control which cuts off the fuel supply and sounds an alarm. Failure of vacuum tube or phototube in monitoring units causes instantaneous safety lockout of burner.

Combustion Control Corp., 77 Broadway, Cambridge 42, Mass.

Heat Exchanger by Carlso'n Applicable to Resistance Welding

A heat exchanger, originally developed to meet the need for the cooling of power tubes in induction heat and RF units, is applicable to resistance welding installations. The Carlso'n heat exchanger, Mark I, Model I, eliminates scaling and corrosion in the water passages, lengthening the life of electrodes by proper cooling, and reducing maintenance and downtime to the minimum. It is claimed to save from 50 to 80% of the tap water ordinarily used in resistance welding applications.

Construction of the unit incorporates a closed system of finned copper tubes which provides a heat-transfer area of 15.04 sq ft for each 24 in. of tube length. Distilled water is circulated in the closed system by a centrifugal pump driven by a 1-hp motor which has a capacity of 12.5 gpm at 30 psi and 9 gpm at 80 psi.

The outer shell provides a reserve of 5 gal. of distilled water constantly circulated. Using only 0.1 gal. of tap water per min per kw, this unit will dissipate heat to the value of 25 kw. In welding applications, a thermal switch, located at the hottest point in the cooling system controls the tap-water flow by means of a solenoid valve.

The construction of the unit permits varying its capacity by lengthening or shortening the exchanger unit, and varying the pump and motor to suit. Units from 12 to 40 kw are available.

Carlso'n Inc., Griswold St. Ext., P.O. Box 846, Warren, Ohio

Sol-Speedi-Dri Compound Absorbs Floor Greases and Oils

The Sol-Speedi-Dri is an absorbent compound for floor greases and oils. It is said to be fluffy offering 10% greater bulk per lb, making large areas of slippery floors safe.

Safety and Maintenance Co. Inc., New York, N. Y.

ACOUSTICAL - TILE DRILLING MACHINE drills simultaneously all the holes in a 12x12-in. acoustical tile. Hole diameters are 3/16 in., 21 rows in each direction, totaling 441 holes. Production is between 20 and 40 tiles per min depending on the type of material being drilled and the hole finishes required. Both hollow paper type and standard twist drills have been used. Tile is hydraulically positioned for drilling. — *Zagar Tool, Inc., 23880 Lakeland Blvd., Cleveland 23, Ohio*

Pittsburgh CARGOTAINERS

reduce handling costs 65% at Wagner Electric

One of the most recent materials handling problems solved at Wagner Electric Corp. was the unloading and delivering of steel backing plates in the truck and passenger car brake division.

With the installation of collapsible, wire-mesh Pittsburgh Cargotainers, they report that "Handling costs are down more than 65%, and twice as many plates can be stored in any given area."*

1 Previously, the steel backing plates were unloaded by hand from roller conveyors then stacked by hand in the bins. When needed, the shields were loaded manually on specially designed hand trucks for delivery to operation.

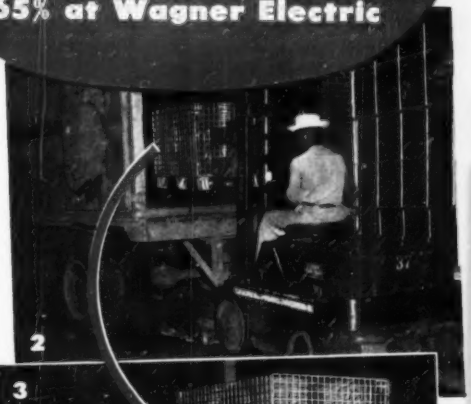
2 Fork truck picks up loaded Cargotainers from tailboard. These steel shields have been loaded directly into the collapsible wire containers in the truck in which they were received, eliminating the need to maneuver conveyor into the van of the truck.

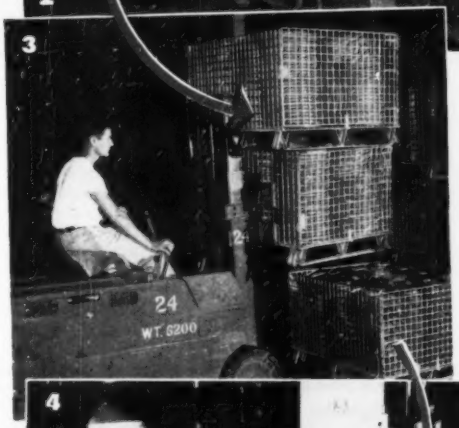
3 A second handling has been eliminated at storage, where Cargotainers can be stacked without need for unloading. The efficiency of stacking the Cargotainers allows twice as many plates to be stored in any given area.

4 Fork truck delivers containers to operator, who takes parts from container instead of from manually loaded hand truck. When empty, Cargotainers fold up, occupy minimum of space until used at beginning of next cycle.

You will be interested to know how Pittsburgh Pallets and Cargotainers can reduce your materials handling costs. For your copy of our catalog, write to Department AM, Pittsburgh Steel Products Company, Grant Building, Pittsburgh 30, Pennsylvania.

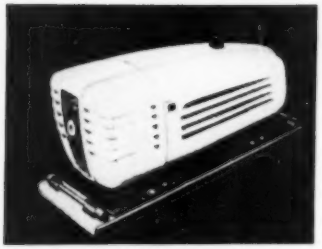
**From "Wagner Electric Corp.," FACTORY, January 1949.*





Pittsburgh Steel Products Company

A Subsidiary of Pittsburgh Steel Company



Portable Electric Sander Has Pad Speed of 5000 rpm

The Century low-cost portable electric sander weighs 4¾ lb and features a non-stalling, high-speed motor encased in a streamlined die-cast aluminum-alloy housing. The compact sander operates on the "Orbital Motion" sanding-action principle.

The 4-in. high sander reduces operator fatigue without sacrificing the stamina and power. Standard-size abrasion sheets cut in thirds are used, and as many as 4 or 5 sheets can be loaded at one time.

Sterling Tool Products Co., 1340 N. Milwaukee Ave., Chicago 22, Ill.

Fixed-Center Oil-Circulating Head Offers 34 Spindles in 6 sq in.

The fixed-center oil-circulating head has been designed mainly for high speeds, although it is also used for large cluster boxes on way-type machines. The 34-spindle 6-in. square head, has been operated successfully at 10,000 rpm with very little heat.

Designed to eliminate oil seal and other rubbing parts, it is ball-bearing equipped. The head contains an oil pump with a built-in, vane-type pump. Oil is pumped to the top of the head and by centrifugal force spreads over the entire upper surface. It then cascades down over the bearings and gears.

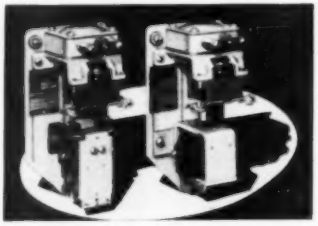
U. S. Drill Head Company, Cincinnati 4, Ohio

Duro-Test Fluorescent Color Heightens Detail Perception

The Vis-A-Ray fluorescent color is said to heighten detail perception. The color concentrates its rays in the spectral range which is easiest on the eyes. The curve of the new Duro-Test color compiled from readings taken from a sensitive spectrophotometer follows closely the spectral distribution curve of maximum eye sensitivity.

The new color is recommended for general lighting installations and for applications where fine, critical and accurate detail work is required, such as machine shops, drafting rooms, watch assembly and textile plants. Vis-A-Ray is now available in 20 watt, 40 watt and slim fluorescent lamps.

Duro-Test Corp., North Bergen, N. J.



Dc Pneumatic Timer Has Adjustable Period from 0.2 to 3 Min

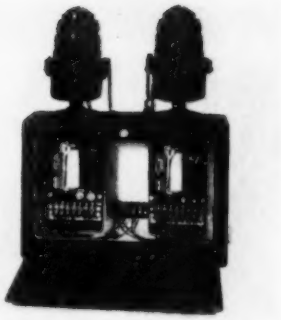
Dc pneumatic timer, Class 9050, is similar in construction to the company's popular ac design. Less than 10% variation, plus or minus, from the mean timing period is said to be possible. Timing period is adjustable from 0.2 sec to 3 min. Time is adjusted by a finger-tip setting of a knurled knob or micrometer dial. Usual applications are found in timing motor acceleration, machine sequences, process-industry operations, resistance welds and similar functions.

Square D Company, 4041 N. Richards St., Milwaukee 12, Wis.

Baldor 60 Series Buffer-Grinder Powered by a 3400-rpm Motor

The No. 60 Series buffer-grinder is powered with ¼-hp 3400-rpm capacitor-start capacitor-run motor. Standard equipment includes a 6-in. grinding wheel on the left-hand side and a 6-in. wire brush on the right-hand side. Ball bearings are of the sealed-for-life type which require no lubrication. Net weight is 34 lb.

Baldor Electric Co., 4351 Duncan Ave., St. Louis 10, Mo.

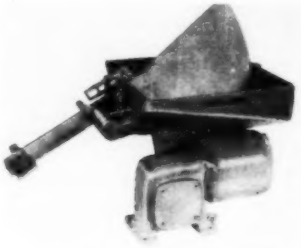


Light Signal Combined with Gage Monitors Strip Material

A self-contained light signal device to be used with the P&W Model D Electro-limit continuous gage or "flying mike" signals the operator of a rolling-mill continuous-inspection line or a shear by means of lights when the strip material is "off gage." It can be used to control an external circuit for classifying.

The device consists of one red and one green lantern, two electronic relays and a suitable mounting case. Limits are set on the contact meter and when plus and minus limits are exceeded, an electric contact is made through the relays, providing a control circuit.

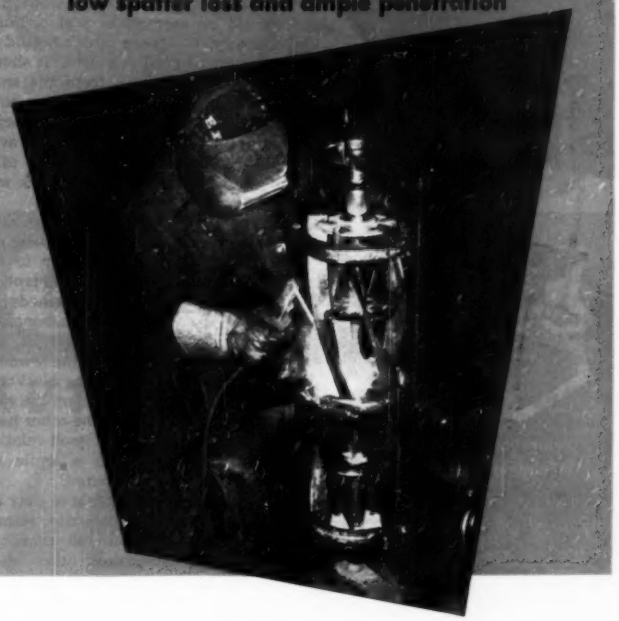
Pratt & Whitney, Div. Niles-Bement-Pond Co., Hartford, Conn.



AUTOMATIC HOPPER FEED, Model H-500 is a self-contained feeding unit and is powered by means of a 1/4-hp gear motor which also serves as a pedestal for mounting. The hopper will feed many different types of work such as bolts and screws. It feeds cylindrical work from ⅛-in. dia to ⅜ in. dia and lengths of 4 in. It will also handle headed or shoulder work in the same diameters and lengths. This unit can be attached to centerless grinders, induction heaters, punch presses and other special machines and fixtures — *Feedall Machine and Engineering Co., 70 Vine St., Willoughby, Ohio*

For Extremely Low Hydrogen Content Weld Deposits

with no under bead cracking, minimum porosity, low spatter loss and ample penetration



No. 312 Electrode for Mild Steel (E-6016)
No. 394 Electrode for High Tensile Steel of High Hardenability (E-10016)

Due to the extremely low hydrogen content of the weld deposits, Airco No. 312 (all position A-C or D-C) is especially recommended for welding hard-to-weld steels (without preheating) such as hardenable steels . . . high sulphur free machining steels . . . cold rolled steels . . . low alloy or mild steels where stress relieving cannot be employed . . . and steels to be vitreous enamelled after welding.

Airco No. 394 (all position A-C or D-C) provides low hydrogen content weld metal deposits of *high tensile strength* on hardenable steels without pre-heat or post-heat treatment. It is also used on carbon steel containing 0.30% or more carbon and should be used on steel containing alloying elements in addition to a high carbon content.

For more information about Airco Nos. 312 and 394 Electrodes, write your name and address on the margin below and send it to your nearest Airco office or authorized dealer for a copy of Catalog ADC-650A.

More news about AIRCO products

NO. 387 ELECTRODE (E-6012)

A high speed all position electrode (D-C or A-C) — ideal for welding mild steel when fit-up is poor. It exhibits excellent operating characteristics, particularly when welding vertically down, and produces a minimum of spatter. Airco No. 387 maintains a high degree of welding performance throughout the entire length of the electrode when high currents are used.

NO. 375 ELECTRODE

Specifically designed for producing machinable welds in cast iron. Deposits are smooth and uniform, bonding well with the cast material; free from internal and surface porosity; and make water-tight joints. Also, color of deposits will approximate that of cast iron. No. 375 can be used in all positions with A-C or D-C.

AIRCOLITE HARDFACING ALLOY

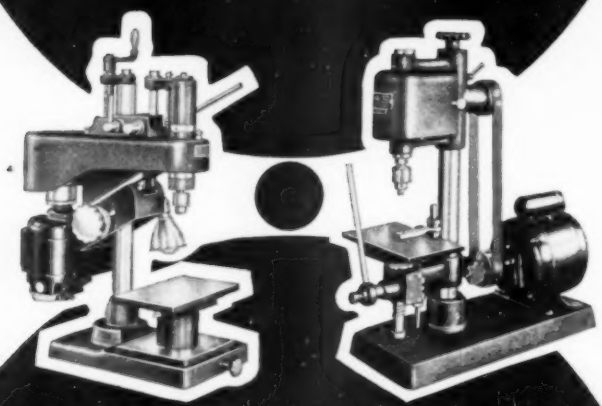
This new alloy (for oxyacetylene and electric application) is especially recommended for pulverizer hammers, coke crusher rolls, and similar parts, subject to *severe abrasion and medium impact.* With one application of this wear-retarding material, the service life of both new and worn parts is increased, in some cases, at least 25 times.

* * *

Air Reduction supplies Oxygen, Acetylene and other industrial gases . . . Carbide . . . and a complete line of gas cutting machines, gas welding apparatus and supplies, plus arc welders, electrodes and accessories. Ask us about anything pertaining to gas welding and cutting, and arc welding . . . we'll be glad to help you.

AIRCO AIR REDUCTION
Offices in Principal Cities

SMALL PRECISION HOLES
DRILLED TAPPED
AT LITTLE COST



Hamilton Varimatic Drilling Machine.

Hamilton Precision Tapping Machine.

The "Hamilton" line of four small hole, precision drills were developed for tool room use and built to the requisite tolerances. In use, they were found to be so brawny that they rapidly found their way into production.

During the years of their use on production work they have been proved to "stand up" under heavy production loads and to maintain their accuracy.

Eighty percent of the present sales of these machines are repeat orders.

The Hamilton Small Hole, Precision Tapper is the ideal companion tool to the "Hamilton" line of drills. It incorporates the same stamina and is built to the same tolerances.

Unsolicited letters from users are enthusiastic in appreciation of this machine's many exclusive features.

DESCRIPTIVE LITERATURE ON REQUEST

The time you spend in investigation of these machines will be paid for in production gains.

THE Hamilton TOOL COMPANY
SUPER SENSITIVE DRILLING MACHINES, TAPPING MACHINES, PORTABLE UNITS
830 SO. NINTH STREET • HAMILTON • OHIO • U • S • A

ROUND TABLE Discussion

"GOOD MORNING TO YOU"

Might one venture to suggest that, rather than being considered archaic to wish an acquaintance good morning, or good night, in the works, whether he be boss or laborer, it should be treated as just ordinary courtesy, to ignore which would be a breach of good manners. It should signify a departure from the snobbish boorishness which, at one time, and sometimes still does, characterize the treatment of the man in overalls by the more ornate but often less useful black-coated worker with all his superficial eminence.

A sour or smileless face has nothing to recommend it; it may be due to a highfalutin conceit or to bad digestion. For the first, a metaphorical kick in the pants is a remedy, for the second, a dose of bicarbonate of soda may help. Some people still live in the past when the common people were serfs and the blackcoats were, if not the masters, on the same side of the fence. On the other hand, the production and good-relations value of a nod and a smile can hardly be over-estimated.

Of course it is possible to play any practice to death. The writer remembers a works where 50 years ago foremen greeted each other, daily, with a handshake and an inquiry regarding each other's health. Unfortunately, their treatment of their workmen bore no indication of their courtesy toward each other. Whether such an exhibition would have been considered archaic or futuristic did not appear.

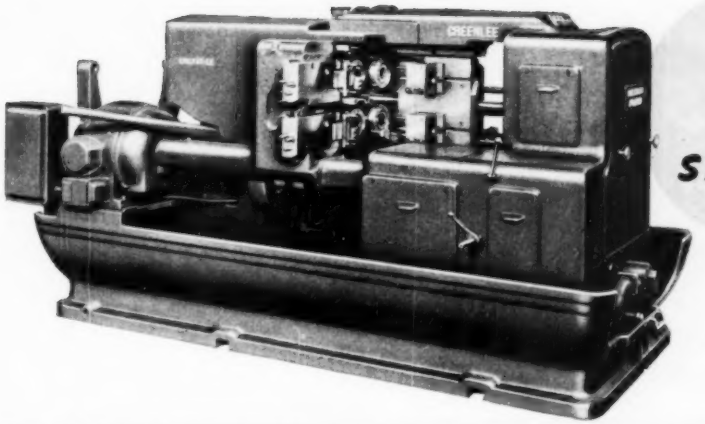
P. E. James
Lincoln, England

•

TALK OR SWEAT FIRST?

It is strange how hard it is to get modern ideas across to many old-time foremen, or even to some of the higher supervisors. Understanding people is one of the many things that was partly ignored in the olden days. A foreman in those days sat around during the lunch hour and talked with the boys. Too frequently today, the foreman has become too important to spend time with "just a worker." In many cases the workers themselves are not desirous of associating with the white-collar foremen. The unions have done a lot of "educating" in this respect.

A foreman, therefore, if he is to



4 SPINDLE

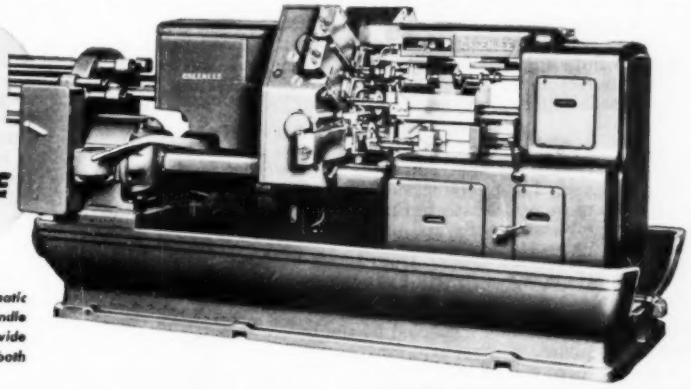
THE GREENLEE "FOUR"

A heavy-duty automatic made in 1⅝" and 2⅝" spindle capacities. The "Four" incorporates all the cost-cutting features of the well-known "Six" (see below).

GREENLEE

AUTOMATIC SCREW MACHINES

6 SPINDLE



THE GREENLEE "SIX"

A ruggedly-built, high-speed automatic . . . available in 1", 1⅝", and 2" spindle capacities . . . capable of handling a wide range of work . . . widely used on both short and long-run jobs.

OUTSTANDING FEATURES OF ALL GREENLEE AUTOMATICS

Write for literature describing in detail all the features of Greenlee Automatics.

PRODUCTION MACHINERY
GREENLEE

UNIVERSAL TOOLING — Tool holders fit any cross-slide cavity . . . are easily and quickly changed . . . reduce equipment costs.

INTERCHANGEABLE CAMS — Can be changed at will without re-adjustment of tools and holders. Cam storage is held to a minimum . . . cam costs greatly reduced.

BUILT-IN THREADING DRIVE AND FEED — Not an extra attachment, but standard equipment on Greenlee Automatics.

BUILT-IN COOLANT SYSTEM — Eliminates cumbersome piping in tooling area . . . gets coolant right where it does the most good.

LARGE TOOLING AREA — Permits using many timesaving, cost-cutting auxiliaries that often eliminate second operations.

Various special adaptions of standard Greenlee Automatics can be made . . . for handling second-operation work . . . for tooling extra-long work pieces . . . for multiple feed-out arrangements, etc.

Send us details of your work. Let our engineers show you how profitably Greenlee Automatics can be applied to your production.

GREENLEE BROS. & CO., 1726 Mason Ave., Rockford, Ill.

MULTIPLE-SPINDLE DRILLING, BORING, TAPPING MACHINES • AUTOMATIC SCREW MACHINES • AUTOMATIC TRANSFER PROCESSING MACHINES

HY-PRO ENGINEERING increased production from 1,000 pieces per tap to 12,000 pieces per tap

PART: Check nut for air-conditioning fan blade.

PROBLEM: Stringy consistency of 1020 steel caused the 3 and 4 flute taps, used on this job, to pick up and seize often breaking the tap on the 1st or 2nd piece. Production never exceeded 1,000 pieces per tap. Did the Hy-Pro Sales Engineer think it possible to design a tap that would increase output per tap?

HY-PRO SOLUTION: Samples sent to the Hy-Pro Engineering Department were studied and tested. They suggested using a two flute spiral point tap with a special Hy-Pro finish. Manufacturer reports average production per tap now exceeds 12,000 pieces.

Above is a typical example of how the Hy-Pro Sales Engineer can help increase threaded-hole production. His expert engineering counsel backed by the most up-to-date tap production methods combine to solve tapping problems rapidly and profitably.

All Hy-Pro Taps are ground from tough uniform quality high-speed steel and given one of the Hy-Pro exclusive surface treatments.

Each tap is completely inspected by the latest electronic quality control equipment, your assurance that there will be no dimensional variance in Hy-Pro Taps of a stated size.

These precision manufacturing methods plus the ability of the Hy-Pro Sales Engineer to prescribe the correct tap for your particular job means *sustained accuracy* on your production line resulting in higher productivity from your tapping machines.

Let Hy-Pro solve your tapping problem—call a Hy-Pro Sales Engineer today.

Order from your distributor.

HY-PRO TAPS

HY-PRO TOOL CO.

NEW BEDFORD, MASSACHUSETTS

A SUBSIDIARY OF CONTINENTAL SCREW COMPANY

know his men, must spend a little time with a man before he starts to work on a job. Maybe the front office has the "family tree," but sometimes the best of families have a black sheep. The foreman can and should make it his job to discuss enough of present-day topics and world conditions with the new man to learn what the leanings of his new employee are. Maybe he won't fit into his group of men. Maybe he will try to stir up trouble. If the foreman has some idea this may happen, he can be watching for it and if it does come . . . he will not be caught completely unawares.

As to being "pink or red," the front office probably is in a much better position to find out than is the foreman. Most good "reds" are well trained and to most of us who are unsuspecting, they are normal people who may once in a while have a difference of opinion. They are almost always very careful where they talk . . . and particularly if they are active workers of the Communist party. So the old-guard foreman who often came up the hard way is not qualified to sort out his shades of pink and red.

A new employee does need some talking to. He must be told shop policies. Sometimes an employment manager is "too tired" to give him those details or perhaps he is not familiar with them. At any rate, the foreman, before the new employee starts on his job should take him out into the department, introduce him, show him around and assist him to get acquainted and feel "at home." It will save time and the new employee will respond by orienting himself much more quickly. Tell the new employee exactly what you expect of him as to quality of work and his general behavior. After he has worked for a couple of weeks, a follow-up of this discussion should take place. In this manner a foreman can size up his new employee and can tell whether the fellow will turn out work that will meet company quality or if he will become one of those employees whose work must be constantly checked.

It is always better to talk to employees than to neglect them. Make a new employee realize he is a part of the company and an important part at that.

Charles D. Townsend
Centralia, Mo.

•

IS BUSINESS, BUSINESS?

When the time comes to lay off some of the men, the foreman in most cases has a more difficult decision to make than during the hiring. If he

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makes a mistake during the hiring, he can always replace the man but once he lays a man off, he doesn't know whether he'll get him back if it becomes necessary.

Some companies have a policy which will guide the foreman, usually on a seniority basis, others leave everything up to the foreman. Some times the foreman is told how many men should be laid off or how much he should lower the payroll. In the latter case, some of the higher rate men have to be laid off.

The foreman, in some cases, uses this layoff period to eliminate some of the undesirables whom he never could find concrete reasons for letting go. As long as the foreman follows the seniority list or his quota includes all the undesirables, the layoff presents no problem. It is when the foreman's list includes some of his key men that he must make a tough decision.

In a shop where all men have the same seniority, the foreman must take the man's ability in consideration. He will prefer all around men to stay with him to spread out the meager work. The orders on hand will guide him in determining who should stay to complete them.

Some foremen will use sentiment to guide their decisions. He will place the bachelors or childless husbands on top of the list. He will toss his brother-in-law's name back and forth and no matter which list it finally lands, his conscience bothers him. Other foremen will fill their lists with men of certain nationalities or religions. I think some foremen walk through the shop and lay off the first employees they meet, then go back to their desks to tackle the next task.

In a community where the company is a taxpayer, it is a good policy to hold on to the employees who exercise an interest in the community. A lay off affecting the home owners might increase the tax burden of the company. Churches will seek more help from the company if the members are unemployed and cannot support it.

Laying off help is one of the most unpleasant tasks a foreman confronts and whether he does it by seniority, sentiment, or prejudice, his conscience still bothers him.

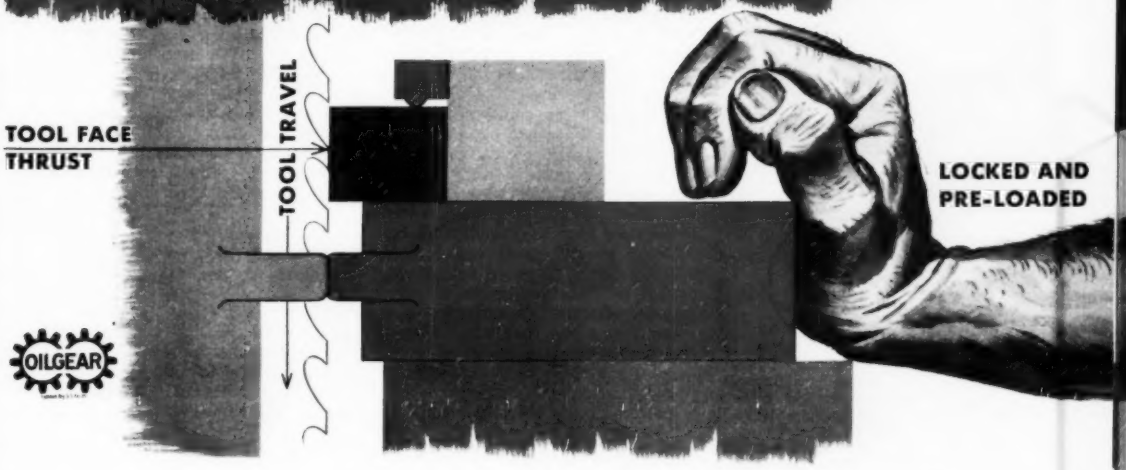
Frank J. Zarnowski
Rutherford, N.J.

■

CLIQUE OR CLICK?

Ed's gloom should give way to pleasure over the fact that one of his workers seeks to have another relative hired in the same shop, even though one or more of his kin are

YES! You can maintain closer broaching tolerances with OILGEAR Pre-Loaded Work Tables



If your broached parts are not being finished to consistently close tolerances and flat surfaces, it is evident that the table operating and holding mechanisms on your broaching machines are yielding to tool face angular thrusts. It is equally obvious that *NO* table which is *NOT* pre-loaded and thus rigidly held in broaching position can withstand these forces without deflection.

This is a broaching problem which Oilgear has solved with its patented and exclusive work table shuttling mechanism which both *locks* and *pre-loads* the tables in broaching position. Under peak tonnage tool face thrust there is no measurable table deflection. Parts are held firmly in broaching position and do not yield to varying broaching tool forces. Consistently close tolerances and true flat surfaces are easily maintained.

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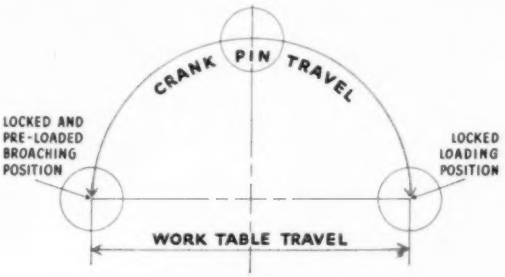
Oilgear's fluid power, direct ram-actuated, heavy-duty crank mechanism shuttles work table to and from broaching position at controlled high speed. Cushioned, 180° harmonic motion of crank eliminates starting and stopping shocks and positively locks table under pre-load in broaching position. Parts do not have to be clamped before table moves. Automatic clamping and unclamping of work is easily applied.

DIAGRAM ILLUSTRATING HIGH-SPEED HARMONIC TABLE MOTION



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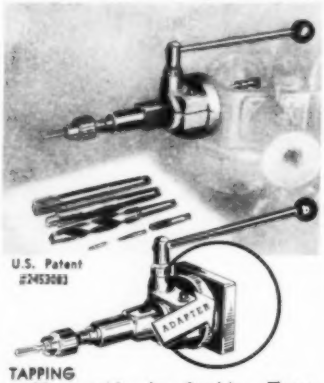

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Wilton, N. H.

already employed there in the plant.

I say he should be pleased, since it shows how well regarded conditions are if an employee is willing to recommend the shop as a place of employment for a brother, cousin, uncle, or whatnot.

Ed seems unduly pessimistic about having more than two members of a family work together, although I cannot see why this should cause any concern. On the contrary, when several relatives are in the same shop, there is certain to be more of an esprit de corps among them, such spirit inducing others to work in harmony.

Advantage is taken of this fact by big industrial concerns who know how turnover of employment decreases production and costs money, because the new worker must be broken in before he is really worth his wages. And these firms realize that when members of a family work in the same plant they are less likely to leave for any or no reason. To overcome labor turnover, firms even appeal to their employees to recommend friends or relatives, because they know that when someone works beside a friend he is a happier and consequently more productive individual.

Ed's alarm that unforeseen trouble with one member of a family will cause friction and slow production or even result in the loss of the services of the other relatives if one of them should quit or be discharged is without foundation. If Ed's quarrel with a family member is for cause, the others would understand the justification and not be influenced because of consanguinity.

Ed should take a leaf from the book of the personnel department of nationally known firms and be glad to have as many people of the same family as is possible, with the understanding, of course, that they will not be given extra consideration, and that their services will be retained only as long as their productiveness from the standpoint of quantity and quality meets with the approval of management.

Milton E. Sussman
Brooklyn, N. Y.

•

Where cliques have been allowed to form, I know from experience they can cause trouble. What causes or allows cliques to form? Poor supervision is the cause. If the boss is slack, weak and indecisive in his dealings with the men he is supposed to lead, employees will take advantage of it in time and will form

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cliques and please themselves pretty much as to how they will obey instructions. They will often interpret them to suit themselves in just the same way children will do if they have too-indulgent parents.

That type of foreman is keenly aware of his shortcomings, but he has not the moral courage or backbone to change. Sooner or later he gets let out, leaving behind him a gang of employees used to having their own way—no discipline at all in the shop and thus making the job of running the shop efficiently (and at the same time earning the esteem of the workers) terribly hard for the new foreman who takes over.

In a very large plant, a new superintendent was brought in from another district. He was unknown to any of the employees. He was very young for the job, but he was a big likable chap with great ability and full of enthusiasm.

He spent the first weeks just getting acquainted with every employee, around 150 of them. He made a point of contacting everyone, asking just what their job was, inquiring if they had any trouble in meeting the output called for, and if so he wanted to know what it was. During these chats he had gained a tremendous lot of information. He knew where the weak spots in production were and why.

The second week he donned a pair of overalls and he and his assistant spent their time really working on the pieces that were not keeping up with the production schedule, and also, of course, getting better acquainted with the men. These two fellows set such an example that it was contagious and in but a few short weeks all the loafing by the clique had disappeared.

You see this chap had personality — a way with him. He only had to set an example, and as all the fellows wanted him to like them he could, in a few weeks, do anything with that crowd and that department. It got to be one of the most efficient in the plant.

There are lots of old New England mills where there are seven or eight employees, all related, working for the same boss. You see, most of these original mills were located out in the sticks. Families lived then and do now in mill houses. They have to make their own enjoyment in community meetings. There is no picture house, the result is that the locals practically all marry a girl or boy they went to school with. In fact they hardly come in contact with people from outside long enough to get acquainted. My first job in the U.S.A. 25 years ago was in one

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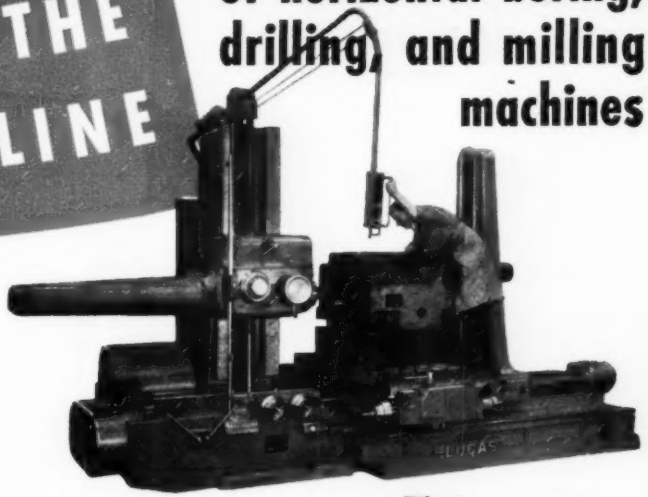
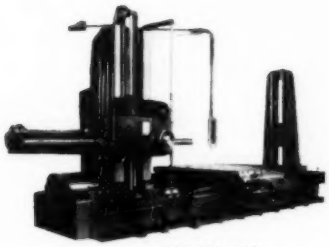
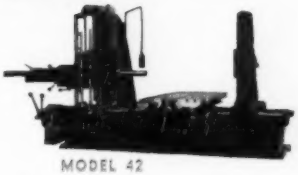


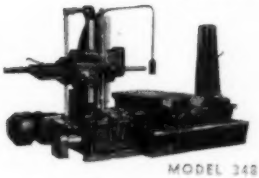
MODEL 460



MODEL 548



MODEL 42



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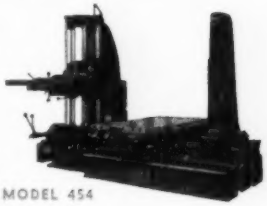
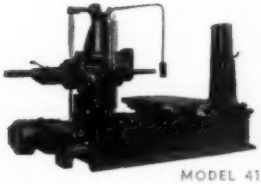
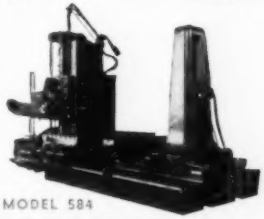


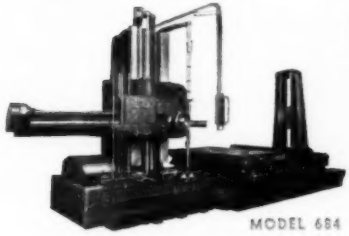
MODEL 454



MODEL 41



MODEL 584



MODEL 684

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of these mills. There were around 300 employees. There were 14 employees all named Hindle, ten working for one boss, and at this moment there are four old bosses of that name. The majority of the people in that community are related, either by marriage or closer still, to each other. That mill has paid good dividends year after year, and has earned the reputation of being one of the most efficient mills in New Engiand.

There are no cliques in any plant today where the supervision from top to bottom is efficient—that is, no cliques during working hours which delay output.

The only trouble I have ever noticed caused by relatives was where they were working for a boss who was related to them, and subsequently took unfair advantage of this relationship.

Arthur Silvester
Niantic, Conn.

•

PASSING THE HAT

"Passing the hat" has been going on year after year and, even though many a deserving one has received the benefits thereof, the fact remains that voluntary contributions are basically wrong. The knowledge that the "boys" chipped in to aid one who is in dire need is in itself a great satisfaction. There is something spiritually elevating in opening up one's heart to the need of one's fellowman who is in distress. Unfortunately, this spiritual makeup is in the minority.

There is a great need of some kind of relief agency in any manufacturing plant to offset the unfair means of obtaining funds by way of the "hat" route. The question of the moment is how that relief should be handled. To leave it to the individuals—passing the hat—results in an unequal load being carried by those who do not hesitate in doing their share and more. The "cough-up" system enables the shirker to exercise his evasive prerogative at the expense of the willing donor. We have the call of the Red Cross, Community Chest, March of Dimes, and many other worthy organizations to which the willing contribute every year while too many pay no heed to the call for help. We have with us the D.T.D.'s—the grouchy tightwads who yell "We're being dimed to death." Then there is the character who shrugs his shoulder and says to himself, "Let George do it."

To eliminate this unfair distribution of burden-carrying, I'm in favor of establishing a source of relief

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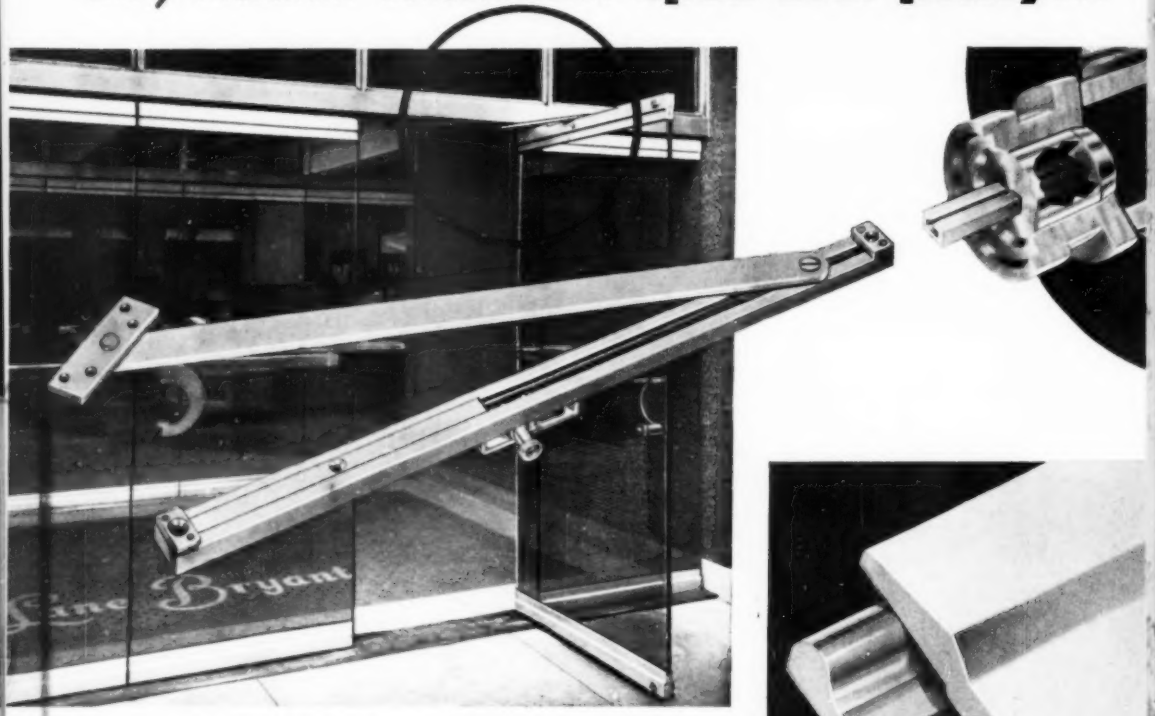
To learn how special brass shapes helped one manufacturer, see next page ▸ ▸ ▸

Every Merchant believes in the **open door policy...**



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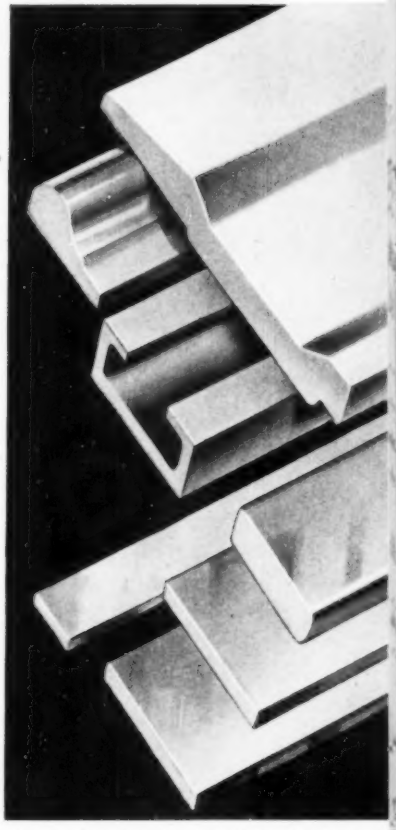
The experience of Glynn-Johnson Corp. (Chicago) in improving its product while simplifying production should be interesting to manufacturers who must keep down costs without sacrificing quality.

These Concealed Overhead Door Holders provide a safe, smooth, "hold-open" and "shock-absorbing" control for glass doors. Glynn-Johnson reports that the use of extruded architectural bronze shapes has reduced machining time and speeded up finishing operations. Other results: Seven simplified Anaconda Extruded and Drawn Shapes are now the principal components. Bronze makes a better product, combining architectural beauty, adequate strength and maximum durability. The smooth operation that is built in, stays in.

The Anaconda Extruded and Drawn Shapes illustrated at the right are *wrought* metal... tough, strong, dense-grained, smooth-surfaced and easy to machine. Special shapes, extruded, drawn or rolled, are available in copper, brass, bronze and special copper alloys—in an almost limitless variety of cross-sections for an almost limitless number of applications. We'll be glad to tell you more about them.



Shapes used by Glynn-Johnson, slightly less than full size.

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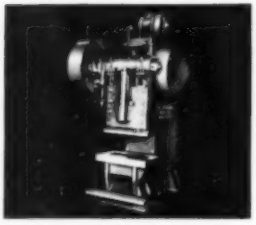
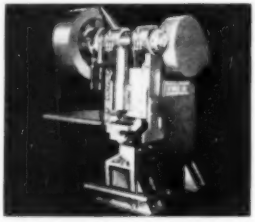
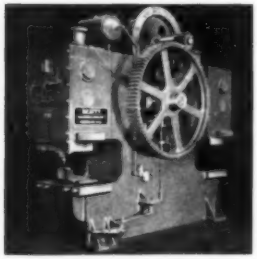
BEATTY 250-ton Gap Type Press for forming, bending, flanging, pressing.



BEATTY Single End Punch available in capacities up to 200 ton.



BEATTY Single End Bar Shear available in capacities up to 300 ton.



BEATTY 200 ton Double End Toggle Punch.

"BLACK SHEEP" among engineers is the fellow who is *fully* satisfied with the way *anything* is being done. Not so with Beatty engineers! Our motto is that, "There's a better way to do it." And we have helped find that better way for hundreds of heavy metal working operations — punching, coping, shearing, forming, pressing, flanging, extruding, V-bending. Our broad problem-solving experience qualifies us to make expert recommendations on *your* problem, no matter how intricate. If you have a specific problem, if you are not fully satisfied with present production, call us in. We may very well have the answer.

HYDRAULIC HEAVY METAL WORKING EQUIPMENT

BEATTY MACHINE AND MFG. COMPANY
HAMMOND, INDIANA

where everyone is called upon to contribute his share whether he likes to or not. To apply this system I would call upon the personnel departments of the various firms to handle it. The manufacturer's share in it is the expense involved in handling. This relief fund to be drawn on by the individual in need. A committee, consisting of a member of the department in which the needy one works and a representative of the personnel office, should investigate the case and determine upon the justice of the application. In the event that an employee should leave the company, his contribution should be returned to him. This should be an incentive for him to contribute without any "beef." I think that it should be understood that any money given should be returned to the fund whenever the receiver was in a position to do so. This understanding would eliminate any feeling of pauperism. Incidentally, it might be necessary to pass the hat for a while to accumulate sufficient reserve!

John Homewood
Ontario, Calif.

•

The best thing in any organization is co-operation, and to show appreciation to the fellow that does the best he can, is a word of encouragement on the job. In an organization the workers, supervisors and management should work hand in hand, in every problem on the job and off the job. As one team there cannot be any failure. Let me be more specific: Sports — baseball, football, etc. All work together, the players, the captain, the manager and the higher-ups. All must work as one team to gain their goal. If one of them does not do his part, they are doomed to failure from the start. The same applies to any manufacturing organization: all must pitch in and do their best to make it a success.

For any man that is doing a good job in any organization, a pat on the back is always appreciated and it is a good investment. If for any reason a man is not doing his job right, the duty of the foreman is to see why—not by abuse or a calling down but to find the cause. If the man is naturally one who does not give a damn or is one of those that is a clock watcher, he does not belong in a good shop. Get rid of him. On the other hand if the man is a good conscientious worker then the foreman should look in and find out what bothers the worker. Is there any trouble at home or financial trouble

*EXTREME PRESSURE

All production machinery will last longer — give better service — if the proper lubricant is used. That's why you will find it profitable to use high quality Tycol oils and greases in your plant.

There's a reason! No matter what your lubricating need — *EXTREME PRESSURE, high or low temperature, high speed or any other service condition — there's a Tycol oil or grease suited to your specific requirements.

Refined from the highest grade crudes, Tycol lubricants are exceptionally resistant to breakdown which means greater economy . . . longer machine life for every type of equipment.

Tide Water Associated will gladly recommend the Tycol lubricant that meets your particular requirements. Call, write or wire your nearest Tide Water Associated office today.

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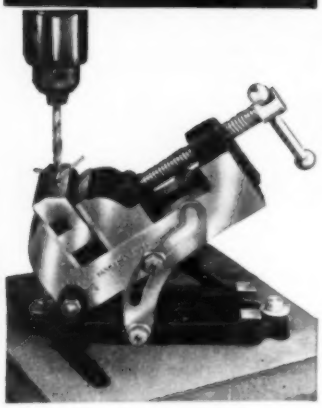

"YANKEE"
ANGLE VISES

One look at this "Yankee" Angle Vise and any shop man sees a set-up shortcut. It's the quick way on small jobs. Just two easy steps. (1) Lock work in the vise, machined square and true on base, sides and front end. (2) Tilt for any angle up to 90° and engage positive adjustment lock. Work is then set up for any job, or series of jobs . . . hand work on the bench; for drilling, milling, grinding or sawing at the machine.

Quick-release swivel base for bench use. Work moved from bench to machine, transferred to next operation, without disturbing alignment. No mistakes, no waste.

Available in two sizes . . . 2" and 2¾" jaw widths . . . with or without swivel base. Each vise equipped with hardened steel V block for holding round stock. Write for Vise Folder and the "Yankee" Tool book.

NORTH BROS. MFG. CO.
Philadelphia 33, Pa.

YANKEE TOOLS NOW PART OF STANLEY THE TOOL BOX OF THE WORLD

or bad health? The wise foreman or manager will then do more for the organization if they will try to be helpful to the man in trouble, to straighten him out.

If a worker is sick and he is home on his back, then more than ever it is the duty of the organization to be helpful in all ways, financially and by visits to the sick man.

Now coming back to passing the hat. No, by all means, No. A fund should be established that every one should contribute a small amount every payday, or it should be deducted from the pay. The company should also contribute and keep record, and a specific amount be paid when a man is sick. I will go even further and say that a card on the man's birthday, flowers on special occasions should be sent.

The fund should be administered and supervised jointly by the men and company as there are more workers than management. The workers should have a bigger hand in management, regular meetings should be held for that purpose to conduct the business of the fund or kitty, as Al called it. If a man is in need of more than the specific amount, a vote of the men should be taken, and given from the kitty. Many concerns have a fund or kitty and I have never heard of any of them that are sorry to have it.

The working man that works in a place where they have a fund or kitty is a happier worker. He feels he has security on his job, he does not have to worry if sick, and the one that has no financial worry when he is laid on his back on account of sickness will recover sooner. That is a fact that any accident and health insurance company statistics will prove to be so.

Some men will pass the hat at any opportunity. If they cannot do it themselves, they will see that others will do it for them, and they will do it for them at first opportunity. I will call those chiselers. Many a conscientious worker will not want the hat passed around for him. I know of a few that actually refused a collection that was taken up by passing the hat around and they needed it badly. I also know some for whom a collection was taken up by passing the hat around and when they came back instead of being thankful they complained that it was not enough and called the men in the shop cheap skates.

In conclusion, by all means have a kitty to be used in all occasions, financial aid in sickness or death, flowers in special occasions, wedding anniversaries, births in the family. It will repay in good will and every one will benefit when cheer is passed around.

Michael Axler
New York, N.Y.

". . . and now, fellas & gals, a word from our sponsor"

TO THE EDITOR

Shop or No Job

I read your article, "Are New M.E. Graduates Theorists?" in the April 7 AMERICAN MACHINIST with a great deal of interest. I am taking this opportunity to give you my views and experience, which I am sure also represent the general attitude of other members of our management.

We have been employing a few M.E. graduates each year for positions in Manufacturing, Sales and Engineering Departments. We employ the same methods that most all companies employ today in selecting these graduates for trainees. It has been our experience that unless an M.E. graduate has had some shop courses, he has difficulty in properly acclimating himself to the trainee program, which is largely in our experimental test and shop departments. So convinced are we, from the experience over many years, that M.E. graduates must have as much shop background as can be gotten in a college course, that we do not hire those who have not had this experience. We have also gone so far as to stop visiting colleges where shop courses have been dropped from the curriculum.

Charles A. Jurgensen
Works Manager
De Laval Steam Turbine Co.

Fourth in a series of Unusual Grinding Wheel Operations

KEEN EDGE MACHETES ARE A JUNGLE "MUST"

This machete, known by the natives of Central America as the "Collins Knife", is used for slashing through jungles, on sugar and coffee plantations . . . and for self protection. It is sharpened to a razor-finish and is standard "dress" equipment for nearly all natives.

Whatever YOUR grinding problem may be, BAY STATE can solve it . . . fast. Possibly the exact specifications to meet your requirements can be supplied directly from large stocks either in Westboro, branch warehouses, or from our distributors strategically located throughout the United States.

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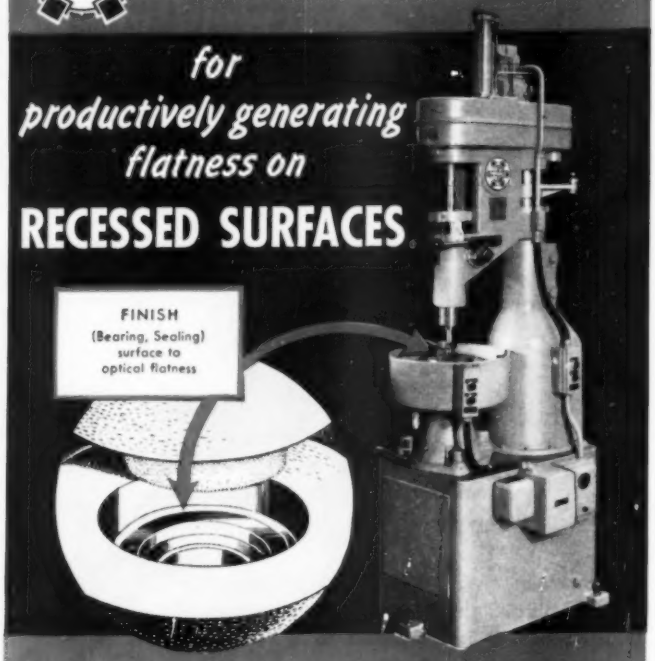
for productively generating flatness on

RECESSED SURFACES



● Microflat machines may be equipped to finish recessed surfaces.

The location of a surface does not limit the application of the MICROFLAT machines. Any surface that can be machined can be finished with this equipment. The surface finish and flatness generated can be controlled and held to any specified requirement.

The machine shown above is equipped with a timer and an air cylinder. The operator loads the part into the fixture and starts the cycle. The fixture rotates, the bonded abrasive finishing surface oscillates and rotates. At the end of a predetermined time cycle the spindle automatically withdraws. Production is 300 pieces per hour.

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Are M. E. Grads Theorists?

I have consulted our group in the field of Industrial Engineering in which our shop laboratory courses appear, and have the following comments from that group (see also *A.M.*, April 7):

1. Our staff members do not agree with your expressed opinion that the shops have either disappeared or suffered seriously in the past few years. They suggest that there are many first-rate colleges in which will be found rather good machine shops. During the past 12 years our curricular requirements in materials and processes have been increased from 4 units 12 years ago to 7 units at present.

2. "It is true we do not teach shop work in the old-time manner. We are not trying to train machinists, we are teaching engineers in the fundamentals of machines, what they are; what they will do; what they will not do; and the cost of using them."

3. "We have never seen any signs of cooperation on the part of equipment manufacturers. We pay full retail price for all machine tools. In fact, I can produce some examples of companies refusing to help even a little bit with information."

4. The statements made in the past are true of some schools; however, the statements are too sweeping on the basis of the facts presented.

Everett D. Howe
Assistant Dean,
College of Engineering
University of Calif., Berkeley

•

Shop Work in Colleges?

We of Drexel Institute believe very strongly in machine-shop work (*A.M.*, April 7), in spite of the fact that we operate on the cooperative plan. We believe that a certain amount of machine-shop work in college is not only valuable but necessary in order to prepare our students for their work in industry under the cooperative plan. I think it a great mistake for any technical college to omit machine-shop work.

R. C. Disque
Dean of Engineering
Drexel Institute of Technology

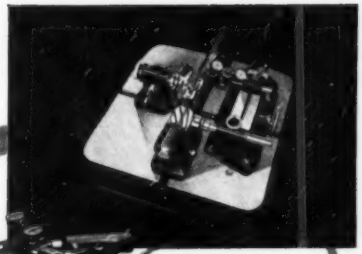
•

Are M. E. Grads Theorists?

You have tackled a difficult problem on page 85 of April 7 *A.M.* and I venture to predict that your revelations will open the eyes not only of practical hard-headed employers of engineers but of educators as well.

Gear errors and Gear noise

should be discovered long before the gears reach final assembly . . .



There is a profit in scrap for the scrap dealer, but most certainly not for the gear manufacturer who suddenly discovers that an entire lot of gears have to be scrapped because they fail to meet tolerance requirements or because they are too noisy.

If economy is important in your plant, the time to find out about machining errors is right at the machine which causes the trouble—not after all the subsequent operations including heat treatment have been completed and the gears assembled in some power unit.

The best insurance against high cost of scrap gears is the use of gear checking machines right down there in the plant where the gears are being produced and where they can be checked periodically by the machine operators.

The Red Ring Gear Checker quickly reveals any dimensional errors and the Red Ring Gear Sound Tester immediately puts an accusing finger on noisy gears. Both machines have laboratory accuracy, they can be used anywhere in the plant or inspection department and they prevent a great deal of waste.

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No matter what type material you're cutting... metal, or non-metallic...you'll find Star blades cut it cleaner, faster... give longer, more economical service. That's because Star blades are made of the finest high grade steel, heat treated for extra blade strength. Teeth are precision-set to assure fast cutting and full side clearance. These Star features mean fewer "time-outs" on the job... greater cutting economy for you. And the Star line is *complete*. There's a Star blade designed for every cutting job a hack saw or band saw can do.

Next time your supplier calls ask him for a free copy of Star's booklet, "Metal Cutting", and the new Star Wall Chart. Both are packed full of valuable information on the selection, use and care of hack saw equipment.

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Makers of hand and power hack saw blades, frames, metal cutting band saw blades and the Clemson Lawn Machine.

I congratulate you on this factual treatment of one of our outstanding dilemmas.

How to correlate theory and practice in order to equip the young engineer to meet his opportunities and responsibilities has approached some measure of solution through your analyses and the quoted replies from those who contributed to your study.

As you well know, the ICS does not compete with the engineering colleges. Our students are employed. They average 27 years at the time of enrollment and 90% of them study courses related to their work. Students from apprentices to professional engineers and certified public accountants apply their "book learning" to their daily tasks in the greatest laboratory in the world—their jobs.

That explains why executives in industry and business cooperate with the ICS in setting up training programs. The significance of this may be partially expressed in terms of enrollments and study results:

1. More than 33,000 students enrolled in ICS courses during the first three months of 1949.
2. An ICS lesson requires approximately 16 hours study time. Last week we received 28,000 lesson examinations for correction.

Of course, I cannot close this letter without expressing my appreciation also for Burnham Finney's telling editorial "A Three-Point Training Program" in the same issue.

Robert B. Keller
Director Educational Research
Intern'l Correspondence Schools

•

Some Things Stick in the Mind

Any mechanic who visits machine shops in various parts of the country, or in other countries, runs into unusual operations that he remembers for many years. Among those which come to my mind is the *hubbing* (not hobbing) of dies for silverware in a shop in New England, perhaps 35 years ago, maybe 40 years. It was in the days when every well-regulated household had to have a silver fruit dish with the sides pressed into the shape of bunches of grapes and other fruits.

In this shop, the hub, or force, was a fine-grained cast-iron block which was sunk into the die block by a gravity drophammer that was hoisted to the ceiling of the second story before it was dropped, guided of course by proper runways. As I recall, the die was roughed out before it was heated and placed in position to receive the finishing touches by having the hub forced into it by the drophammer. The two-story drop was the only one I ever saw.

Another unusual operation dates back to World War I. The Hershell-Spellman Company, North Tonawanda, N. Y., well-known maker of carrousels or merry-go-rounds, had a contract to build Curtiss O X engines for training planes. These engines were about 85 hp. and as notable in their day as was the Model T in the automobile field.

"Buzz" Planing

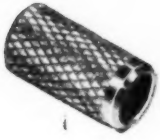
The operation which caught my eye was the surfacing of the crankcase where it was bolted against the cylinder block. It was the first really high-speed milling I had even seen. Imagine my surprise to see the crankcase casting turned upside down on a buzz-planer and passed over the cutter as though it was a block of wood! No fixture or clamps of any kind, just pushed over the rapidly revolving cutter normally used in woodworking. The surface was much smoother than would have been expected and with a cork gasket between it and the crankcase evidently answered all requirements. At least they were used in many training planes.

"Squirty" Copper

A third operation which sticks in mind was seen in a small second-story shop in Pawtucket, R. I., in the early days of gasoline-driven vehicles, when the making of radiators was more of a job than it is now. This shop was making the short copper tubes for the cross-tube radiators, the tubes being between 3 and 4 in. long. It was the first *squirting* job I had ever seen and the only one I ever saw where copper was the metal. The blanks were about the size of a copper cent.

First attempts were made in a screw press on the theory that the metal must have plenty of time to flow and so the screw was turned at a very slow speed. The screw press broke down in the midst of a good-sized order and they needed production, so with fear and trembling they tried a crank press, but slowed it down to a few strokes a minute. This seemed to work as well as the screw press, so they began to speed it up. When I saw it they were running it at 120 strokes a minute and having no trouble. So they decided that they could forget the "time-to-flow" theory. This type of radiator gave way to those with long vertical tubes and I presume the little shop turned to other products or went out of business.

—F. H. Colvin



To produce many thousands of cast bronze bearings day after day, to the uniformly high quality synonymous with the name Bunting requires precise foundry control. This control starts with the raw materials necessary for production such as molding and core materials, core binders, fixed carbon fuel, prealloyed metal in ingot form purchased to Bunting's own rigid specifications, and virgin metals used for ladle additions to control metal composition. Then, too, melting and casting procedures are carefully controlled for the following reasons:

1. To keep gas absorption during melting to a minimum, thus assuring sound, gas-free castings.
2. To effect complete deoxidation of the metal in the ladle before pouring.
3. To insure that each particular casting is poured at the precise metal temperature consistent with highest quality.
4. To insure that molding and core materials are so processed that the correct properties are obtained for good castings, and
5. To insure metal of uniform composition meeting the specification.

Trained foundry and laboratory personnel are required to carry on this exact control as well as chemical and metallurgical equipment of the latest design. Bunting has always taken pride in being the leading producer of bearing bronze of the highest quality and has the facilities to maintain this leadership. The Bunting Brass & Bronze Company, Toledo 9, Ohio. Branches in principal cities.

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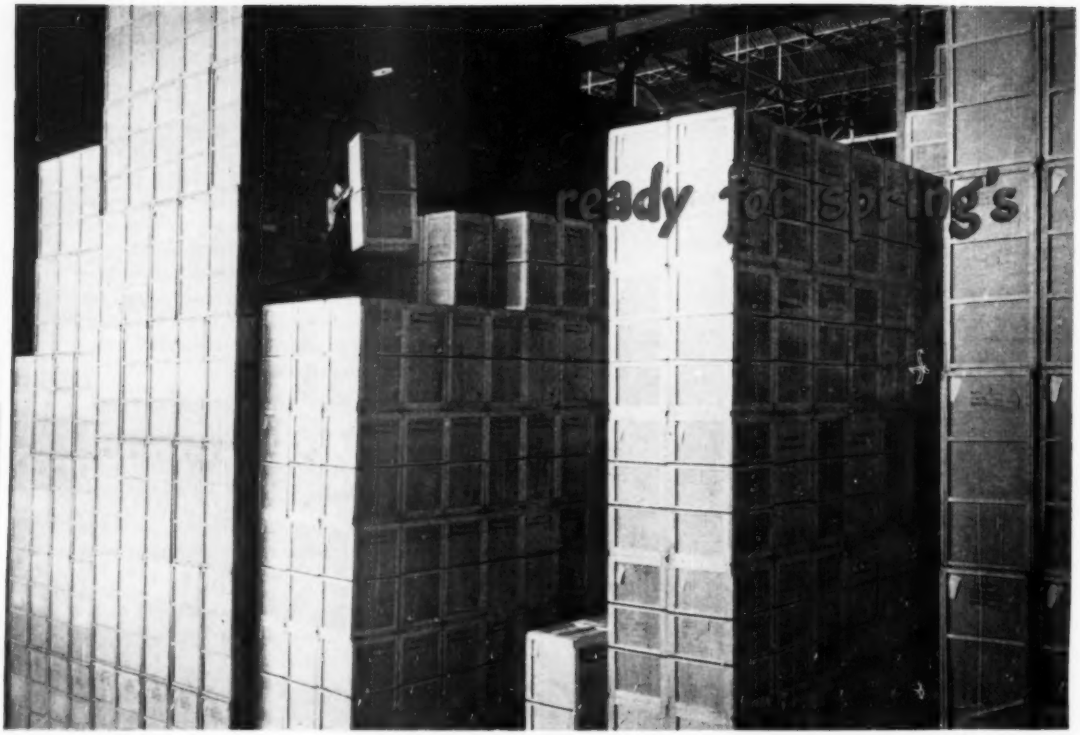
Bunting®

BRONZE BEARINGS

BUSHINGS

PRECISION BRONZE BARS



The well-equipped, appliance-filled house has always been a symbol of the American standard of living. And never has that symbol been more dramatically in evidence than in recent years. Last year, alone, Americans bought 4,530,000 refrigerators, 4,710,000 washing machines, 675,000 home freezers, 225,000 dishwashers . . . millions of other appliances to make living easier and more enjoyable.

Americans will buy millions more this year. But in this first post-war year of the buyer's market, they will be looking once again at price tags, measuring their purchases on a basis of both higher quality and lower costs. And to you who sell to the Metalworking Industry which manufactures almost every home appliance, 1949 offers you a challenging opportunity to let the production executives who build Metalworking's products know how your machinery equipment, parts, materials, or services will contribute to better and lower-cost products.

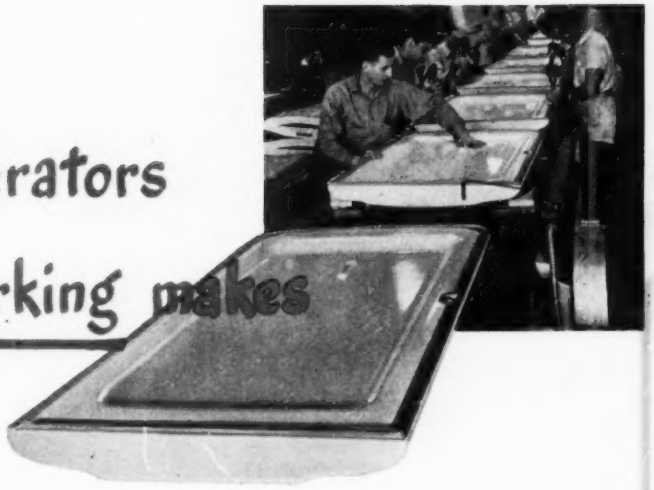
The place for you to tell this story is in the advertising pages of *American Machinist*. And in this widest and best-read of all metalworking magazines, you can sell not only to the men who build appliances for America's homes, but also to the men who produce the products made in *all eleven divisions* of America's biggest and most basic industry.

This *one* all-paid circulation magazine edited exclusively for Metalworking, and for the metalworking production executive specifically, gives you 28,000 paid subscriptions that reach an audience of unmatched buying power. *American Machinist* subscriptions to companies; corporate officials and general managers; department managers, superintendents and engineers outnumber by several thousands the *total* paid subscriptions to any other metalworking magazine. Ask your *American Machinist* representative soon for all the facts on why manufacturers of machinery, equipment and supplies bought by metalworking

...and for what it takes to make

buying rush

...the refrigerators only metalworking makes



plants invest more advertising dollars in this magazine than are invested in any other publication in its field.

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- Metal-fabricating Machinery
- Construction, Mining, and Power Equipment
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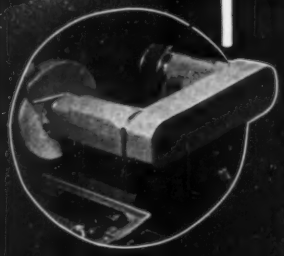
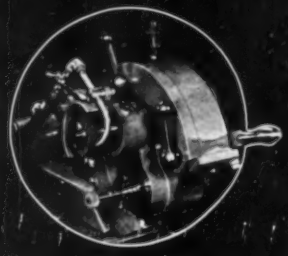
TO PRODUCE MORE OF A GREATER VARIETY THRU EASE OF PRECISION SET UP AND OPERATION



External Bracket



Internal, External Turret

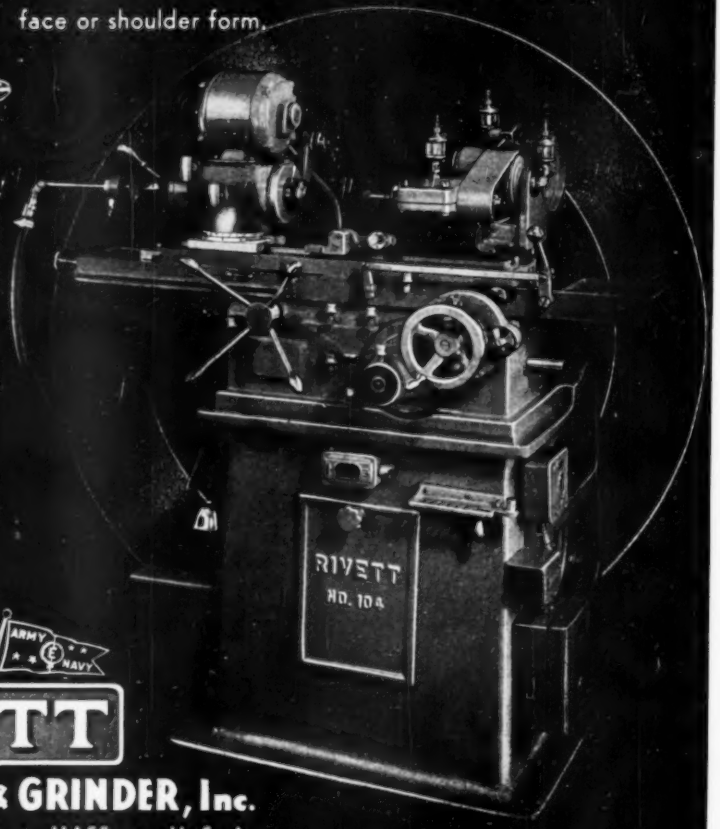
The Rivett No. 104 is a simple, power-driven grinder suitable for tool making and precision manufacturing. Operations of widely varying nature can be quickly set-up and efficiently ground on one or many pieces. Interchangeable brackets are selectively mounted on the cross slide for internal, external, or concentric grinding in straight, taper, face or shoulder form.

RANGE

Internal spindles of suitable design and speed may be selected for hole grinding up to approximately 3" diameter and 4" length.

External bracket with 7" x ½" wheel may be used for on-center or chucked work up to approximately 3" diameter.

Turret for concentric grinding of hole or outside surface is limited to such work as may be chucked.



ARMY NAVY

RIVETT

RIVETT LATHE & GRINDER, Inc.

BRIGHTON • BOSTON • MASS. • U. S. A.

Write for Bulletin 104.

America Needs '49ers

JUST a hundred years ago, the Forty-niners stormed the gold fields of California. They faced staggering obstacles, sure hardship, uncertain reward. Thousands failed, thousands of others realized modest gain, a few made fortunes. None sought or received help or direction from a benevolent government.

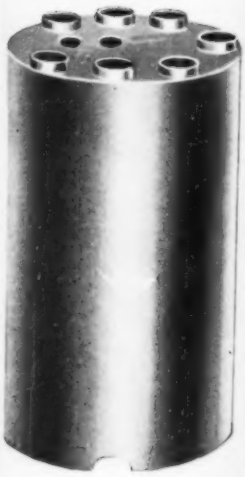
Now a century later, America faces another age of golden opportunity--an era when science and industry reveal new treasure to be had for the making. Turning today's visions into reality calls for '49ers--men of purpose and resolution, courage and independent spirit. You as a leader in your community may find a personal challenge and an inspiration in the Old '49er. By example and precept, you can help America toward her greatest accomplishments--in prosperity and peace.

The Youngstown Sheet and Tube Company

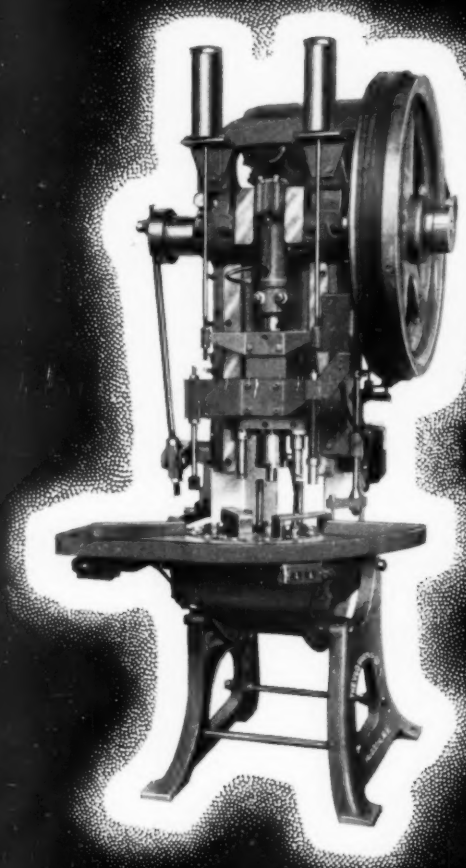
General Offices--Youngstown 1, Ohio
Export Offices--500 Fifth Avenue, New York

MANUFACTURERS OF CARBON, ALLOY AND YOLOY STEELS

ELECTROLYTIC TIN PLATE - COKE TIN PLATE - WIRE - COLD FINISHED CARBON AND ALLOY BARS - PIPE AND TUBULAR PRODUCTS - CONDUIT - RODS - SHEETS - PLATES - BARS - RAILROAD TRACK SPIKES.



designed for multiple operation and produced by.. V&O



PRODUCTION

3000 pieces per hour

This part was notched on the side, 9 holes pierced and extruded on the end in successive steps.

The V&O Dial Feed is equipped with an automatic positive safety stop which shuts off the machine unless it is in perfect register, thereby avoiding any damage to the dies.

Our engineers stand ready to assist you in your stamping production problems.

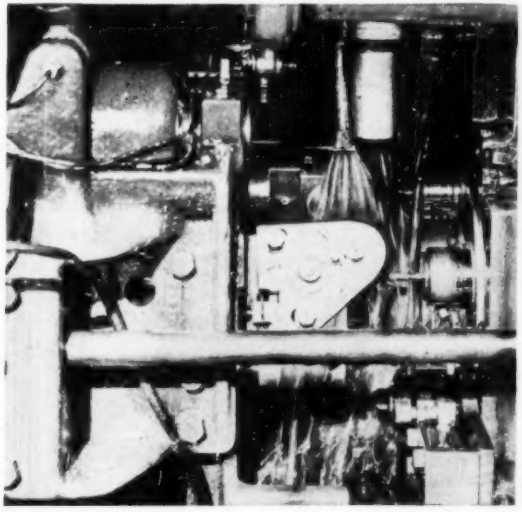
the V&O PRESS CO.

DIVISION OF ROCKWELL MANUFACTURING CO.

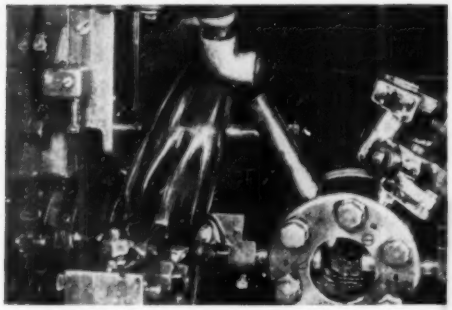
... Hudson, New York

BEST ALL AROUND

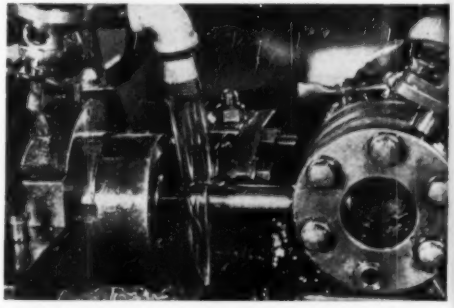
CUTTING OILS NOW READY FOR YOUR SHOP



Eight Hours, No Shutdown. This automatic screw machine, using the new oil on SAE X1315 steel, on forming, facing and cut-off, increased tool life from 2 hours to 8 hours.



Production Almost Doubled . . . This automatic, using the new oil on SAE 1315 steel traveling 225 s.f.m., made switch part in 5 seconds, twice as fast as with other oils.



Drill Life Doubled . . . A new S/V Vacmul was used on this hand screw machine, doing a secondary drilling operation on SAE 1113 steel. Drill life was doubled.

Light-Colored, Transparent, Non-Corrosive

S/V VACMULS PROVED

on Many Metals, Many Applications . . .

Here's the answer to your need for a general purpose cutting oil that is non-corrosive, yet has the highest cutting efficiency yet developed in this type of oil.

The new, vastly improved S V Vacmuls have proved their superiority on a variety of metals and on a wide range of different machining operations.

Light-colored, transparent and odorless, these oils possess exceptional extreme pressure and oiliness characteristics. They give excellent results in job shops and other shops where a single oil is required to do a variety of work.

Operators who have used them in exhaustive tests report greatly increased tool life, improved finish, reduced rejects and production speeded up all along the line. Be sure to get performance facts and figures from your Socony-Vacuum Representative.

SOCONY-VACUUM

GARGOYLE

Lubricants

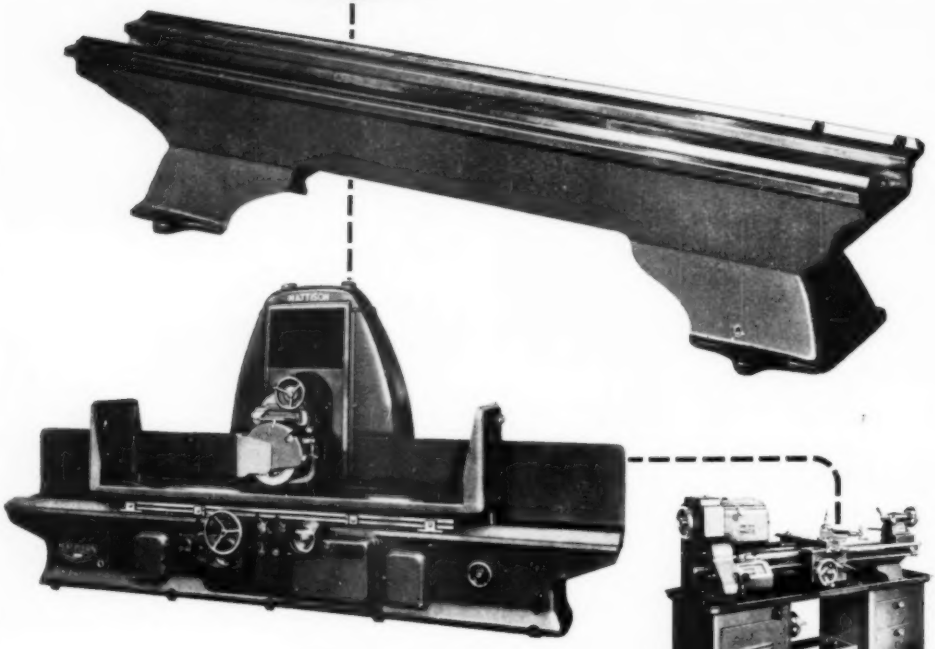
Rely on

SOCONY-VACUUM

Correct Lubrication

SOCONY-VACUUM OIL COMPANY, INC., and Affiliates: MAGNOLIA PETROLEUM COMPANY, GENERAL PETROLEUM CORPORATION

Lathe Beds Precision Ground on MATTISON GRINDER *130 Minutes Time Saving over Previous Method*



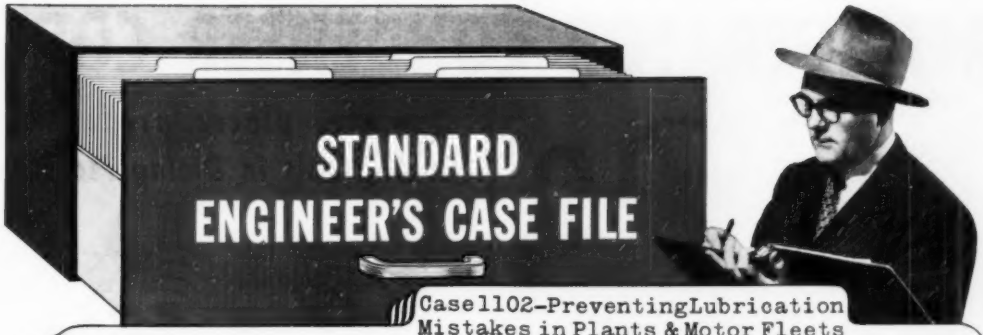
● The Clausing Manufacturing Company are now grinding V and flat ways of their lathe beds on a Mattison Grinder with a saving of time of 130 minutes per bed over previous method of hand scraping. Accuracy is greater, with full length of ways being held to close limits of parallelism.

Rugged, high-powered and versatile Mattison Grinders are built to handle your grinding jobs on a real production basis, providing very close accuracy and a fine finish. They are offered in a wide range of sizes to meet every requirement from 12″ to 36″ wide by 36″ to 192″ long.

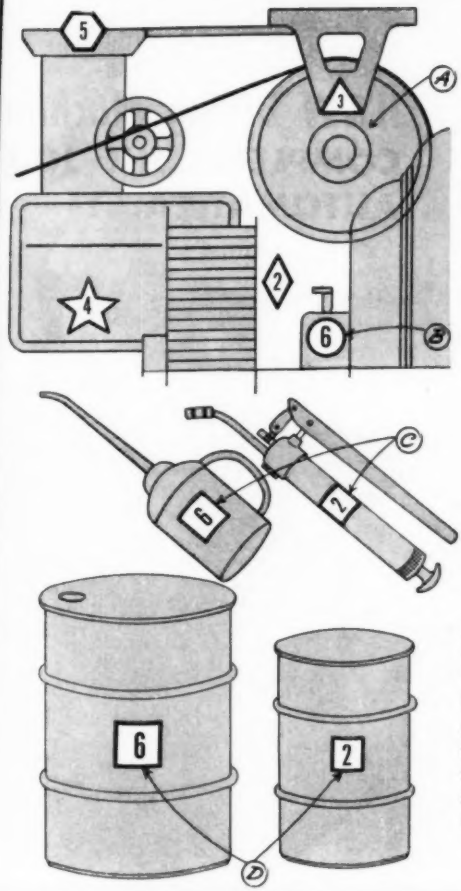
Write for free Set-Up Book, containing further examples, showing how others have reduced time and increased production with Mattison Grinders.

MATTISON MACHINE WORKS

ROCKFORD • ILLINOIS



Case 1102—Preventing Lubrication Mistakes in Plants & Motor Fleets



Many operators of plants and fleets in the West have practically eliminated operation delays due to improper lubrication or use of wrong lubricants, by installing Standard of California's free, coded system of planned lubrication. The system employs symbols instead of colors to indicate lubrication intervals -- stops mistakes caused by color-blindness, faded colors or changed appearance of color in different lights. Available for plants and fleets in the Seven Western States.

A. Black-on-white decalc symbols show desired lubrication intervals at a glance. Are placed directly on machine at lubrication points.

B. Numbers on the decalcs indicate the kind and grade lubricant to be used at each point. Chart card on each machine gives meanings of symbols and numbers.

C. Lubricant number-decalcs on dispensers identify lubricant in each dispenser and prevent its use in wrong place.

D. Lubricant number-decalcs on barrels, cans or other storage show kinds and grades of lubricant in stock.

All decalcs, chart cards and other material for the Standard Coded System of planned lubrication, and installation of the system are free. On request, a Standard Fuel and Lubricant Engineer from Standard Technical Service will survey your plant or other operation any place in the Seven Western States. He will make recommendations, give expert advice and install the Standard Coded System if you desire it.

Trademark Reg. U. S. Pat. Office

For additional information and the name of your nearest Distributor, write

STANDARD OIL COMPANY OF CALIFORNIA

225 Bush Street, San Francisco 20, California

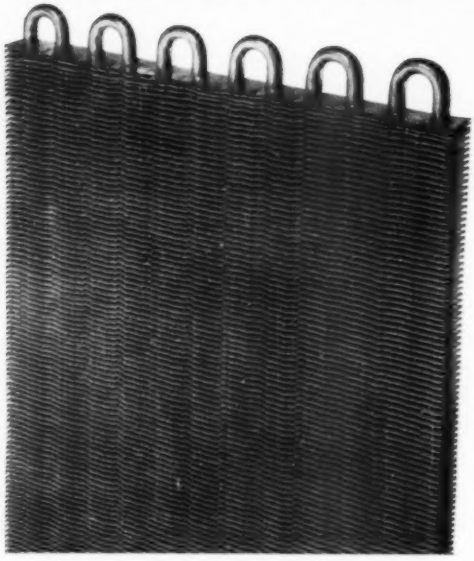
The California Oil Company
Barber, N. J. — Chicago, Ill.

The California Company
17th and Stout Streets, Denver 1, Colo.

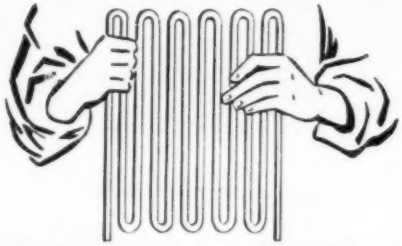
Standard Oil Company of Texas
El Paso, Texas

CALOL

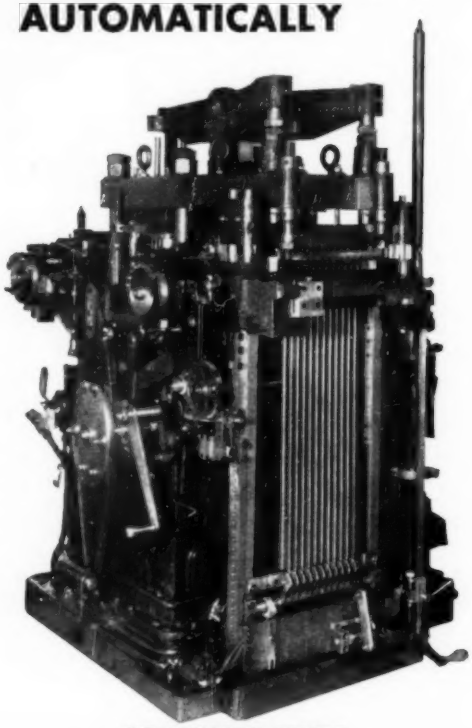
REFRIGERATOR CONDENSER CORE



Operator places preformed tubing unit in Dieing Machine



H&W *Dieing Machine* COMPLETES THE JOB AUTOMATICALLY



PRODUCED ON 50-TON DIEING MACHINE AT

BUSH MANUFACTURING CO. WEST HARTFORD

Here is a machine that produces 38" cores at the rate of one approximately every two minutes, and shorter cores proportionately faster. 100% automatically at 120 strokes per minute, it produces the fins from coil material 12" wide and assembles and spaces them on the tubes, with wings flattened to completely encircle the tubing, and with a collar which strengthens the assembly, increases radiation, and maintains spacing—all at the rate of 120 completely assembled fins per minute. And what is this machine? It is basically a 50-ton Henry & Wright Dieing Machine, equipped with automatic roll feed, special work holding fixture, indexing mechanism and certain other features. The Dieing Machine can perform operations such as this at tremendous savings—as well as regular stamping jobs complete-per-stroke—because it is a truly unique machine offering an unmatched combination of high precision, high production and high die life. If you are seeking ways to cut costs, recognize the fact that hundreds of users are making large savings, on simple blanking jobs as well as intricate stampings and assemblies, and on small-quantity production as well as large. It is to your advantage to know how Dieing Machines might apply to YOUR production—Let us supply the facts.

REQUEST CATALOG 49

HENRY & WRIGHT
DIVISION OF
HARTFORD-EMPIRE COMPANY

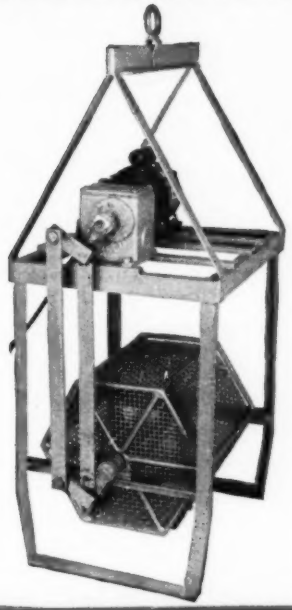
487 WINDSOR STREET
HARTFORD, CONN.

HENRY & WRIGHT DIEING MACHINES

ROLOCK

HEAT AND CORROSION RESISTANT

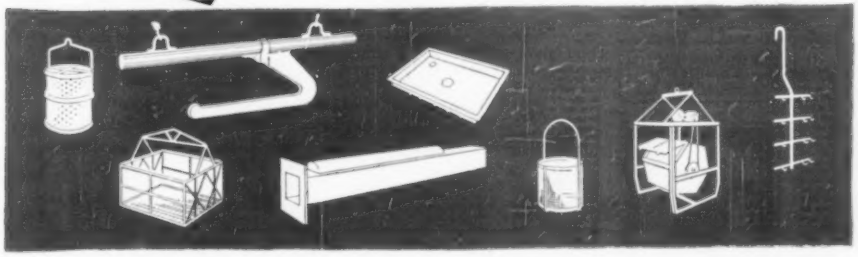
FABRICATED ALLOYS



Rolock engineers welcome tough problems. Here's one they solved in an unusual manner.

The motorized rotating tumbling barrel was needed in a hurry . . . but hard-to-get stainless and impossible monel roller chains couldn't be had in time. So . . . here's a new type of crank drive used between the reducer and barrel shaft. It is fabricated entirely of standard bar sizes, promptly available in any material. It's a low-cost, foolproof, positive drive for almost any conditions of exposure to acid, alkali, heat, molten zinc and salts, with the proper selection of materials and correct bearing design.

With modifications, this design might meet your needs for many finishing operations . . . to improve work, cut costs. May we solve your problems too? Catalog on request.



Offices in: PHILADELPHIA • CLEVELAND • DETROIT • INDIANAPOLIS • CHICAGO • ST. LOUIS • LOS ANGELES

ROLOCK INC. • 1240 KINGS HIGHWAY, FAIRFIELD, CONN.

JOB-ENGINEERED for better work
Easier Operation, Lower Cost

4RL49

Forging Engineering Service... Yours for the Asking!

When you buy National Forging Equipment, National's technical Engineering Service is yours.

National Engineers have had many years of experience in creating and developing hot and cold forging machinery methods and tooling.

This experience helps greatly in qualifying our staff to assist you in the solution of your forging problems—from the original design to the finished forging.

THIS DOOR IS ALWAYS OPEN

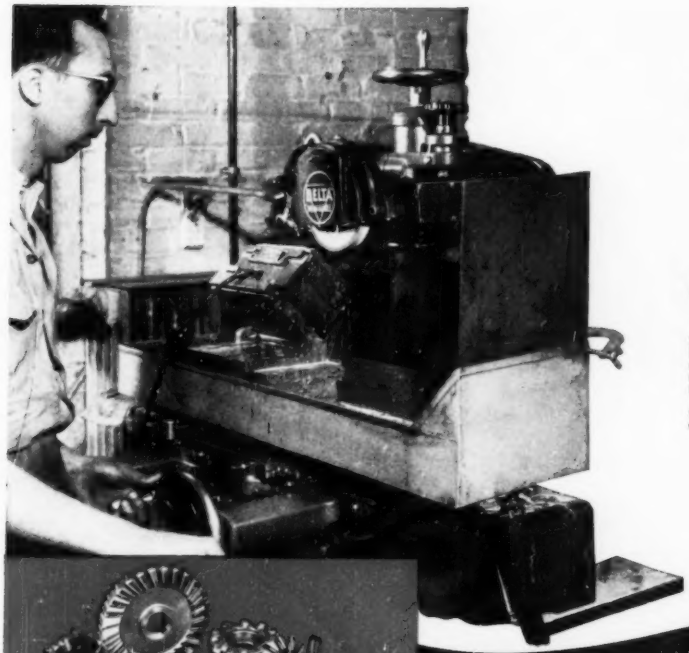
Our Engineering staff, our expert tool and die engineers, our entire organization is always at your service to help you solve your forging problems — present and future. Send us blue prints, a sample of the part you wish to make, or better yet, visit us. We're proud of our plant. We'd like you to meet our people — see our Engineering and production facilities.

75th Anniversary 1874-1949

NATIONAL
MACHINERY COMPANY
TIFFIN, OHIO.

DESIGNERS AND BUILDERS OF MODERN FORGING MACHINES—MAXIPRESSES—COLD HEADERS—AND BOLT, NUT, RIVET, AND WIRE NAIL MACHINERY

New York Detroit Chicago



DELTA MILWAUKEE ®

Delta Toolmaker† Surface Grinder

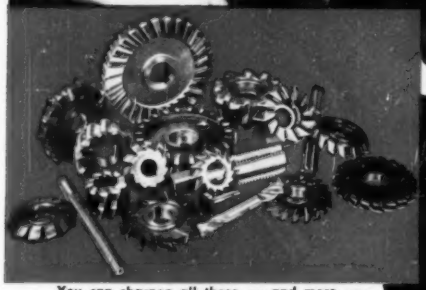
Shown at left working on a lathe bit. Has wide graduations on micrometer, for close settings. Unique wheel adapter saves time and redressing. Many other features. 7" x ½" wheel, 1¼" bore.

With simple attachments, this versatile machine becomes an efficient tool-and-cutter grinder or a chip-breaker grinder.

No. 24-105

$375*

without wheel, motor, or switch.



You can sharpen all these — and more — with Delta grinders.

These DELTA® machines cut grinding costs for toolroom and production work

Delta Carbide Tool Grinder— Combined with Delta's standard tool grinder for hogging down the shank steel, this machine gives you a perfect working combination for sharpening tungsten carbide tools. **No. 23-555** — Complete with lamp attachment, water pot, and wheels - - - - $154*

Delta Grinder with Twin-Lite† Safety Shields — Twin-Lite Safety Shields act as "built-in goggles," flooding your work with light. Fully-machined tool rests. Balanced wheels. Lubricated-for-life ball bearings. **No. 23-405** — Complete with safety shields, lamp bulbs, wheel guards, and wheels. - - - - - - - - - $114*

You would expect to pay much more for the all-around high quality you find in these low-cost Delta grinders. Delta's advanced engineering helps make industrial grinding easier, cheaper, and extremely accurate. Plant owners, superintendents, and engineers everywhere can tell you that.

Delta grinders are available in both bench and floor models—with current and speeds to suit any requirement. Simple, easily-adjusted attachments increase the utility of these machines.

Your nearby Delta distributor has these popular grinders on display now. Inspect them there. Ask about buying on easy credit terms.

DELTA MANUFACTURING DIVISION
ROCKWELL MANUFACTURING COMPANY
MILWAUKEE 1, WISCONSIN

Look for the name of your Delta distributor under "Tools" in the classified section of your telephone directory.

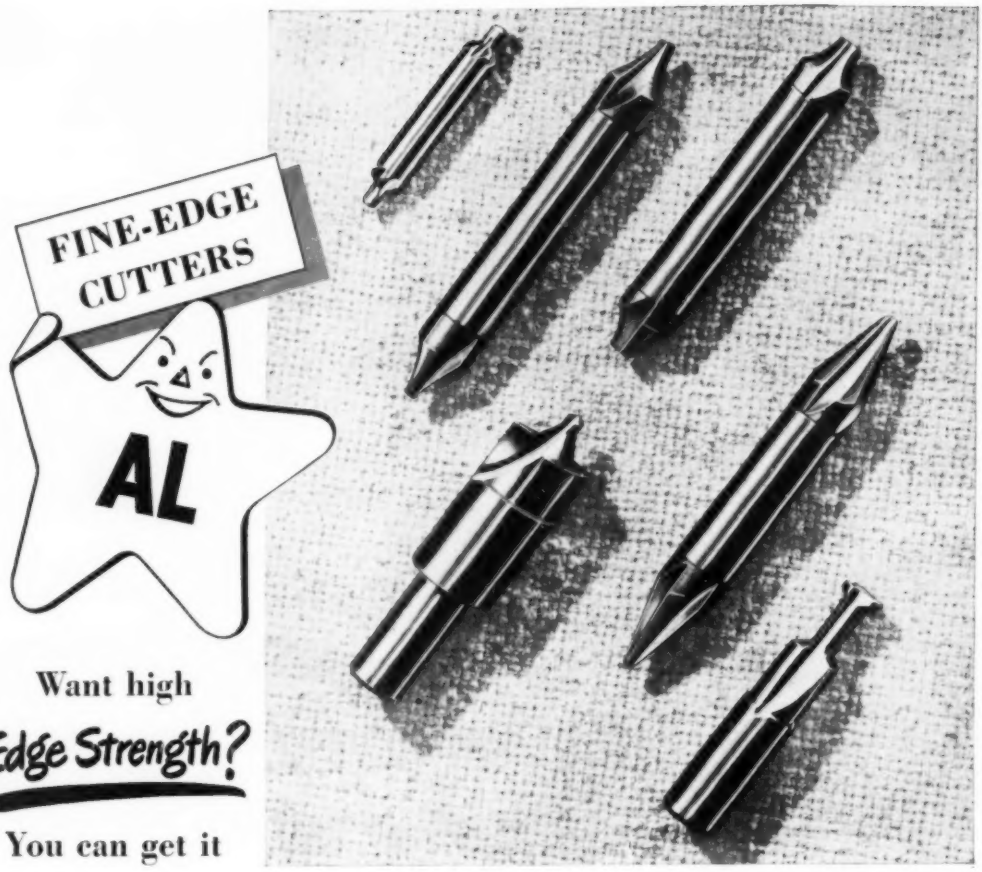
Unihead† — A universally-adjustable work head, designed for use in connection with Delta Toolmaker Cutter Grinder. See details in catalog A-48.

Univise†—The first truly universal vise for grinding, drilling, and milling. With coolant attachment, converts Delta Toolmaker Surface Grinder to accurate Chip-Breaker Grinder. See details in Delta catalog A-48.

TEAR OUT COUPON AND MAIL TODAY!

DELTA MANUFACTURING DIVISION
608F Vienna Ave., Milwaukee 1, Wis.
Send me free copy of Delta Catalog A-48.

Name.....
Title.....
Company.....
Address.....
City.....(.....) State.....



Want high

Edge Strength?

You can get it

with DBL-2 HIGH-SPEED STEEL

Write for copy of

"CUTTING TOOL MATERIALS"

Allegheny Ludlum produces *all* types: the various tungsten and "moly" high-speed steels, cast-alloy materials, and cemented carbides. This 36-page booklet analyzes and compares types, and covers grade selection, etc.—invaluable data for production men. *Write for your copy.*

ADDRESS DEPT. AM-84

A midwestern tool manufacturer, specializing in fine-edge cutting tools, has found DBL-2 *best* for their purpose—added proof of the high edge strength and excellent cutting qualities of this high-speed steel.

DBL-2 (typical analysis: C .80, W 6.00, Mo 5.00, Cr 4.00, V 1.75) represents the 6-6-2 or M-2 type of tungsten-molybdenum high-speed steel. DBL-2 combines high hardness with toughness. Requiring no more than reasonable care in hardening and tempering, you will find it a high-speed steel of great possibilities—capable of giving you performance equal to, or better than, the general-purpose tungsten types, and at reduced cost.

DBL-2 reliability has been proved in a wide variety of cutting tools. Let us help you to use DBL-2 . . . our Mill Service Staff is at your command.

ALLEGHENY LUDLUM STEEL CORPORATION
Pittsburgh, Pa.

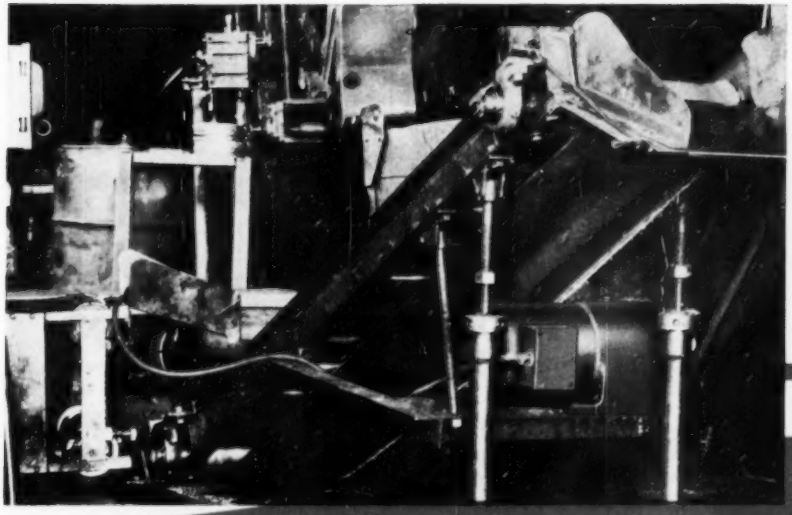
TOOL STEEL DIVISION: DUNKIRK, N. Y

Fine Tool Steels Since 1854

AL

WAD 2473

For Top Performance . . . Long Service



Century ¼ horsepower squirrel cage, gear motor driving a conveyor.

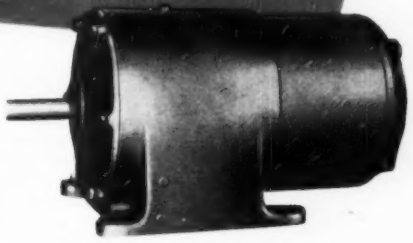
Match the Speed and Power Requirements of Your Conveyors With Century GEAR MOTORS

The conveyor shown here is driven by a Century Gear Motor which provides the correct power and speed to handle the output of a punch press.

Century Gear Motors are available in sizes from 1/6 to 1½ horsepower to provide many combinations of power and speed. The right combination on your materials handling equipment will help to coordinate your production, reduce handling costs and increase efficiency.

Century Gear Motors are engineered to maintain the high torque slow speed shaft in rigid alignment. Mounting feet are an integral part of the rugged, compact gear housing—providing a strong rigid unit.

Specify Century Gear Motors for all your slow speed requirements.



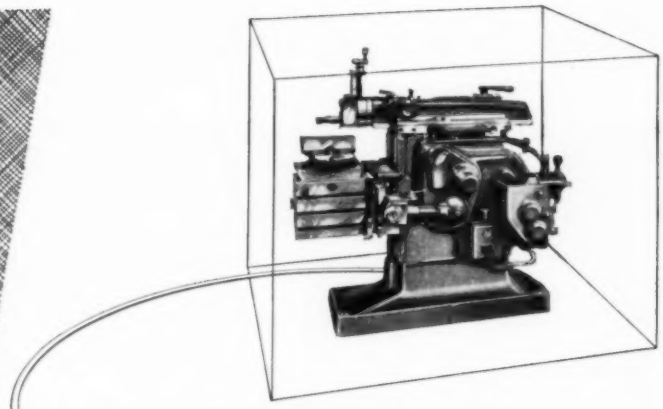
Popular types and standard ratings are generally available from factory and branch office stocks.

Century C MOTORS

-437

CENTURY ELECTRIC CO. 1806 Pine Street • St. Louis 3, Missouri

Offices and Stock Points in Principal Cities



Production Package
ready to go . . .

Buy a Hendey 12" Universal Crank Shaper – plug it in – it's ready to go – without further purchases, because standard equipment *includes* table and vise for positioning and indexing work to any angle. You also get flanged mounted motor, mechanical controls on both sides, automatic lubrication, quick-change swivel head, adjustable, preloaded Timken bearings on the crank gear, plus many other features usually considered "extra".

The Hendey 12" Crank Shaper is finished like a fine watch, both inside and out. Here is an accurate, fast money-maker for tool room and production work. Write today for complete details.

BRIEF SPECIFICATIONS

Length of Stroke	12¾"
Strokes per minute	14 to 200
Speed changes	8
Vertical travel of tool slide	4⅝"
Table top tilts either way	15°
Max. distance vise to ram	8 13/16"
Max. rotation of table	360°
Max. vise opening	10½"
Net weight	2825 lbs.
Floor space	46" x 68"

Other Hendey Machines Include
Tool Room Lathes — 9"- 12"- 14"- 16"- 18"- 20"- 24"
Shapers — 12"- 16"- 20"

THE **hendey** MACHINE COMPANY

MAIN OFFICE & PLANT: TORRINGTON, CONN.

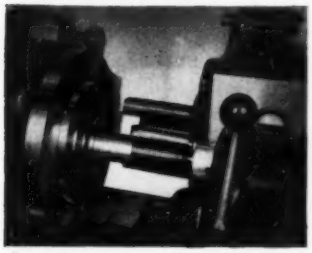
BRANCH OFFICES: New York, Chicago, Boston, Detroit, Rochester, Los Angeles, San Francisco

REPRESENTATIVES: Philadelphia, Cleveland, Pittsburgh

hendey

The Work Head Drive Governs Entire Automatic Cycle of Machine

A feature vital to machine operation, the work head drive rotates work spindle from which longitudinal and transverse cams are driven



through gearing. Provides feeds and rapid traverse, controlled by dogs from conveniently-located dog-wheel.

Accuracy of Cutter vital To Precision Threading

Hanson-Whitney Multiple Cutters, "finished" after hardening, hold spacing, form and relief to close limits. That is your assurance

of accurate, dependable thread milling . . . of long cutter life.

Examples of Threads Produced on 8" x 16" Model

Just a few examples of the precision threading jobs turned out on

this machine. Widely adaptable, the 8" x 16" H-W Thread Miller has external capacity of 8" diameter with 2½" cutter; internal capacity, 8" maximum diameter with 2½" cutter; 1" minimum diameter with 7/16" cutter.

HANSON-WHITNEY

FAST... ACCURATE... FLEXIBLE

SEMI-AUTOMATIC
THREAD MILLING MACHINES

Results tell the story . . . more accurate threading on an economical high speed basis! Hanson-Whitney Thread Millers assure the automatic production of perfect threads, eliminate costly spoilage . . . meet the demand for closer limits. Widely adaptable for straight or taper threads . . . internal or external . . . right or left hand. Multiple cutters finish threads in one revolution of work. Available in three sizes to answer diversified capacity requirements.

HANSON-WHITNEY MACHINE CO. HARTFORD 1, CONN.
Division of Whitney-Hanson Industries, Inc.

Write today for complete details that will help solve your thread production problem.

Hanson Whitney
PIONEERS OF FINISHED TAPS

WITH DICKERMAN DIE FEEDS . . .

WE'VE DONE THE JOB IN ONLY 1/10th THE TIME

You Can Reduce Operator Time by 90%

Add to this production phenomena, the FACT that the cost of DICKERMAN DIE FEEDS is so LOW they PAY FOR THEMSELVES the first month of operation.

PRODUCTION INCREASES up to 300%

Completely automatic and exceptionally accurate, these improved Feeds will handle Brass, Steel, Copper, Paper, etc., from any position on the press and REDUCE OPERATOR'S TIME BY 90%.

Ruggedly constructed, DICKERMAN DIE FEEDS, with no wearing parts, are made in many styles and sizes, can be easily installed on ANY punch press.

Also Manufacturers of HITCH FEEDS

ROL-DIE-FEEDS and AUTOMATIC STOCK REELS

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ELECTRICAL *Broken Tool* REMOVER

Only $95

It's sensational! — Every shop, every tool crib should have one. Removes broken tools and studs by electrical disintegration from a part being machined without damaging the part. Saves castings otherwise scrapped. Set it up on your drill press.

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Coolant Systems for all types of machine tools. Stand-by pump units, and for special application on original equipment.

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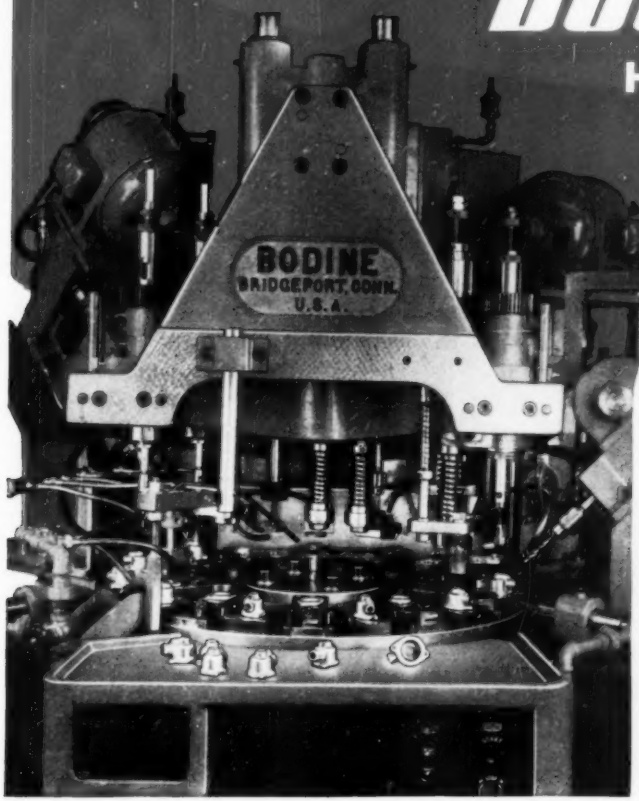
HERE'S ONE ANSWER TO MODERN PRODUCTION

Bodine HAS PLENTY MORE!



AUTOMATIC MILLING DRILLING, TAPPING SCREW INSERTING

Here's how costs go down

PRODUCT: 2 end pieces of brass cast float valve body.

OPERATIONS: Dial has alternate stations, operator loads one fresh casting at each stroke, transfers one piece from station to next one, opposite end up.

- Part automatically clamped by air cylinder.
- Combination tool faces part over 2¼" dia.
- Drill, countersink 2 #25 holes thru ¼" thick ears (combination tool).
- Tap both holes 10-24, completing first pass under spindles. Part turned, located from finished face and 2 ear holes.
- Core drill and face the hole for ¼" pipe tap.
- Tap ¼" pipe thread.
- Core drill and face 7/16" dia. hole at right angles to axis (combination tool, horizontal spindle).
- Drill, counterbore ¼" dia. hole, 45° from axis.
- Tap above hole (angularly mounted drilling and tapping spindles for 8 and 9).

By changing fixtures on dial both ends of float valve body are produced on this Bodine 48-30 machine.

PRODUCTION: 15 complete components per minute.

YOU CAN'T MEET TOMORROW'S COMPETITION WITH YESTERDAY'S MACHINE TOOLS.

Ask Bodine engineers to adapt one of our 6 standard machines to suit your small parts production.

4BD48

THE Bodine CORPORATION
BRIDGEPORT 9 CONNECTICUT

AUTOMATIC DIAL TYPE DRILLING, MILLING TAPPING AND SCREW INSERTING MACHINES

Where in the Thunderjets are DISSTON Aircraft Steels?

"Disston Aircraft Steels are used so extensively in the manufacture of this plane that . . . a picture of the completed airplane would be best."
--REPUBLIC AVIATION CORPORATION

Uncle Sam salutes Republic Aviation for developing and mass-producing Thunderjet fighters. His pleased look takes in Disston, too. For Disston Aircraft Quality Steels are "showing their stuff" in many crucial parts of this great jet plane. It is capable of speeds up to 600 mph—proof enough that steel specifications are rigorous, and that Disston Steels qualify.

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Rounds, squares, flats and hexagons of desired dimensions are obtainable. Or you may have special needs. Skilled Disston metallurgists know how to satisfy you . . . ***with exactness.***

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WHEN YOU BUY A DISSTON PRODUCT YOU BUY DISSTON STEEL SKILL and SERVICE

Ellstrom

chromium plated gage blocks wear 5 to 20 times longer!

round

square

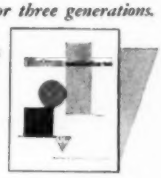
rectangular

How'd you like to make a big dent in your gage block costs? It's simple. Just specify "chromium" . . . Ellstrom chromium plated gage blocks. They're rated "tops" for all-around gage block quality . . . wear from 5 to 20 times longer than ordinary blocks, yet cost but very little more. Made of the finest materials . . . processed under precisely controlled conditions . . . and finally finished with their extra hard gaging surfaces through methods first developed and perfected by Ellstrom to give you longer wearing millionths.

Ellstrom chromium plated gage blocks are available in 12 standard sets . . . rectangular, square, or round . . . in working, inspection, or laboratory accuracies to meet every gage block requirement. Special sets, metric sets, or individual blocks are also available upon request. And every block in every Ellstrom set carries a positive guarantee of specified millionths to give you the accuracy and uniformity you need.

Ellstrom . . . *measuring in millionths for three generations.*

Do You Have the New Ellstrom Catalog? Contains complete specifications and prices on standard Ellstrom Sets . . . plus the new Ellstrom "Build-up" set, Internal Setting Gage, Inspection Service, and Trade-in Allowances. Send for your copy today!



For longer wearing millionths, specify **"Chromium"** . . . **Ellstrom** chromium plated gage blocks!

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Originators of Chromium Plated Gage Blocks

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A STRONG LINK TO ECONOMY..

AT
THE WHITNEY CHAIN
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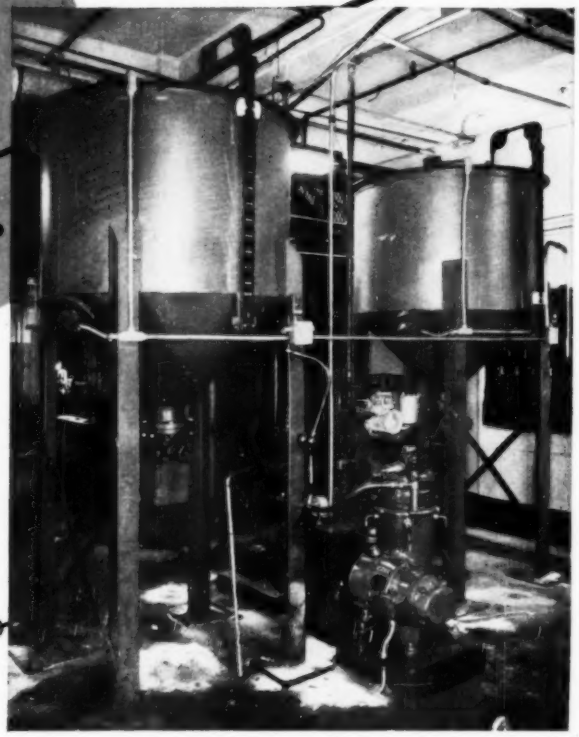

At The Whitney Chain & Mfg. Company, Hartford, Conn., a De Laval Oil Purifier removes impurities from cutting oil by means of centrifugal force. The continuous removal of minute metallic particles from the cutting oil keeps the coolant safe and usable at all times.

Even more important than the oil economies to be effected by centrifugal purification are the production advantages of having plenty of clean cutting oil available. These advantages include longer tool life, higher permissible cutting speeds and minimized wear on moving parts of cutting tools.

Most metal-working plants have several applications for De Laval centrifugal machines. Bulletin MM-1 lists 18 of them. Perhaps you, too, could profit by one or more of them. Send for your copy of Bulletin MM-1.

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TAKE THE KICK OUT OF KICK PRESSES

and the FATIGUE out of Shears with Schrader Pneumatic Machine Controls

The cost is low, installation easy

The cost of a Schrader Machine Control set is low, ridiculously low by comparison with the benefits and savings that can be effected. Any mechanic can readily and quickly make the installation.

1. END PEDAL PUSHING—Schrader Kick Press Control with Pneumatic Foot Pedal completely eliminates this tiresome, monotonous operation.
2. ELIMINATE FATIGUE—Operators welcome the relief of working with "kick presses *without the kick*".
3. REDUCE SPOILAGE—Air power exerts a *uniform* force every stroke, practically eliminates spoilage.
4. INCREASE SAFETY—The hand operated Kick Press Control enforces 2-hand operation, keeps hands out of the danger zone.
5. INCREASE PRODUCTION—The net result of easier, safer operation is an increase in production.

You can select the control that meets your individual needs.

HAND OPERATION—Keeps hands out of trouble. Operates at a touch of the fingers. It is a true 2-handed device.

FOOT OPERATION—Use where hands are required for positioning and holding the work.

HAND AND FOOT OPERATION—When the need for alternating from hand to foot control is required the hand set plus a foot pedal should be specified.

ADD SPEED CONTROL—Addition of a Schrader Speed Control Valve varies the speed of the stroke, accomplishes squeezing or broaching operations with ease.

Schrader Pneumatic Machine Controls are unbeatable for operating shears. The mere *touch* of a foot pedal replaces all that awkward and extremely tiring foot leverage. One man can now position the work, and work the shear . . . and the Schrader foot pedal can be shifted to any convenient point. And remember: with Schrader Controls one machine can do about the work of two, and shear heavier gauge metals.

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FLANGED and DISHED HEADS, STANDARD and ASME, ON HAND, READY TO SHIP

Lukens has many sizes of Standard and ASME Flanged and Dished Heads in stock, ready to ship to you. Hundreds of dies are available for making other styles and sizes, enabling us to ship the heads you need within a short time after your order is received.

Lukens makes heads 4 inches in diameter to over 20 feet; thicknesses up to $6\frac{1}{2}$ inches; of any commercial metal—carbon and alloy steels, including stainless, non-ferrous metals and the widest range of clad steels available anywhere. 3,898 standard Heads are described in Lukens Catalog No. 1.

You should have this list of LUKENS STOCK HEADS

It shows the sizes and gages of carbon steel heads regularly stocked at Lukens. Ask for Bulletin 433.

Wire or telephone Lukens, giving diameters, gages, styles and materials, if you're needing heads in a hurry. Lukens Steel Company, 478 Lukens Building, Coatesville, Pennsylvania.

LUKENS HEADS

"Head Work", a 16mm motion picture in sound and color, on spinning and pressing of Lukens Heads is available without charge. Running time: 27 minutes. Write for a booking date.

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We will gladly rivet sample parts and return them for your inspection.

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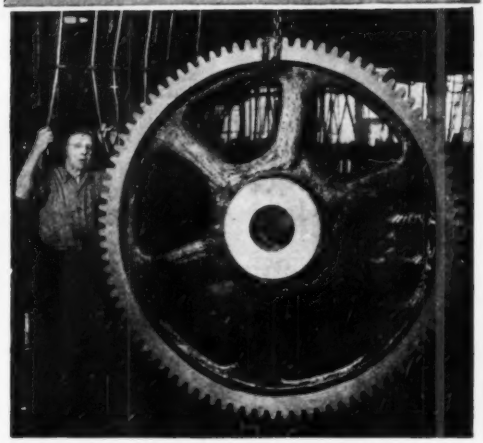

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OUTLAST UNTREATED GEARS
FIVE TO ONE

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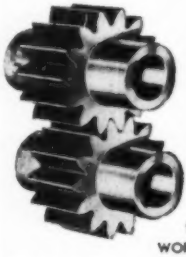

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Because the spindle of the SHELDON TS 56B is mounted on Timken Zero Precision Bearings, extreme accuracy, higher machining speeds and lower production costs are insured. These bearings are by far the most accurate tapered roller bearings that can be made in regular commercial production. Runout or eccentricity is restricted to less than .00015 of an inch. Due to the line contact between the rolls and races, the spindle is firmly supported—no chance of deflection. Because of the tapered construction and provision for take-up in assembly, there is no possibility of end-movement.

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11¼" Swing
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rotates diamond tool
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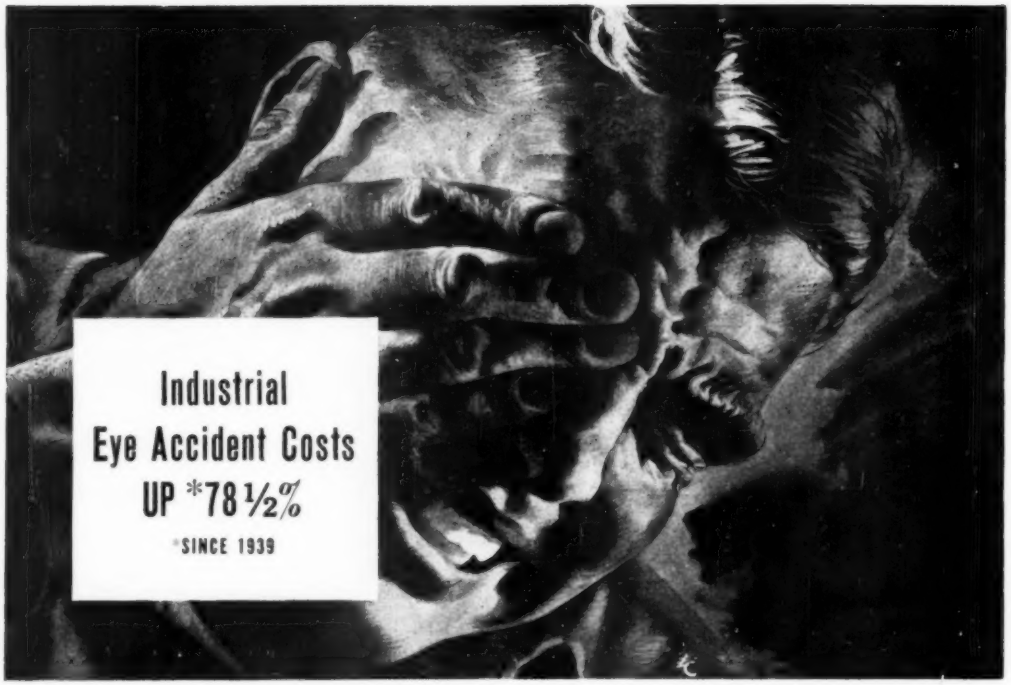

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Your other high costs may or may not be "leveling off" but high eye accident costs are a tax no management need put up with.

Eyes are COSTLY targets when hit by particles that injure and blind. The average cost of a minor eye accident is over seven times the average cost of the goggle that would have prevented the injury. The ECONOMY of this protection is self-evident when it is realized that the cost of the goggle represents far less than two hours lost in productive time of the worker.*

Ask your nearest AO Safety Products Representative to show you how an adequate eye protection program *works* and how much it *saves!*

*Average price of goggles $2.30. Estimated 1949 average hourly earnings of factory workers $1.11 (Source: U.S. News)

American Optical COMPANY *Safety Products Division*

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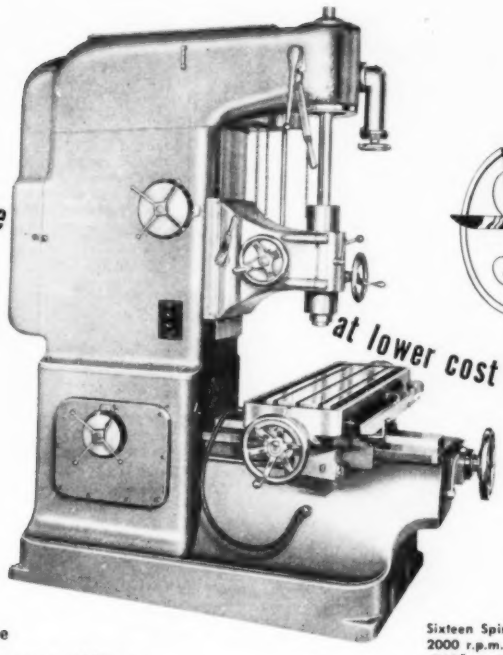
KNIGHT NO. 50

FOR PRECISION BORING AND VERTICAL MILLING

more output in less time



at lower cost and less labor

Sixteen Spindle speeds, 40 to 2000 r.p.m. • 9 Spindle feeds, .005" to .010" • 100" table traverse per minute in both directions • 16 Table feeds, 5/16" to 20" per minute • 7½ h.p. Drive.

Here is a single solid base machine

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Write for Bulletin 46 6-A on the Blake Flute Grinder and find out how to control Rake Angle on your own taps

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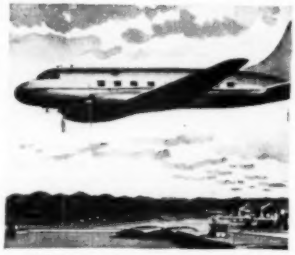

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The Monthly Robertson Bulletin

FOUR HOURS ON BLANCHARDS WITHOUT A SQUEAL

We were delighted when an electrical manufacturer said to us recently, "Let's see what this Robertson Segmental Wheel can do."

We were delighted because we know that people who thoroughly test Robertsons in their own shops soon become enthusiastic users—and boosters—of these unique wheels.

For four hours, this manufacturer ran everything in his shop through on the Blanchard—boiler plate, Neor, Hampden, cold-rolled and Hi-Carbon Hi-Chrome Steel. The wheel—an 18" x 5" x 15" WA301-H3V—took the work in its stride. The only difficulty experienced was "squealing" on boiler plate 24" x 10" x ½" thick. This was eliminated when table speed was increased from 6 to 12 rpm. Other than that, the entire test was run at 12 rpm with .012" down feed per minute.

On one Hi-Carbon Hi-Chrome die, of 65 Rockwell hardness, the work covered approximately one-third of the chuck area. In 15 minutes .050" stock was removed.

Wheel wear at the end of four hours' grinding was ⅛". The Robertson wheel was ½" narrower and required less dressing than former wheels used by this manufacturer. It gave longer life at lower wheel cost.

We invite *you* to give Robertson Cool-Cut Wheels the acid test at any time. Put them to work side by side with other wheels.. You'll be delighted at their ability to increase production at lower wheel cost—and you'll like the substantial bonus in decreased power consumption they make possible.

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RESIN-BONDED AND VITRIFIED-BONDED GRINDING WHEELS • MOUNTED WHEELS • SEGMENTS

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All Baumbach Die-Sets have demountable Leader Pins and Bushings. This exclusive feature permits removing Leader pins for machine work on the die shoe and assures reassembly without loss of alignment. A big time and trouble saver. Write for Catalog.

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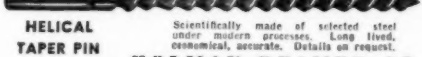

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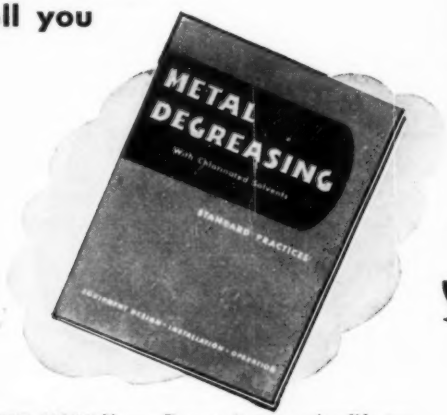

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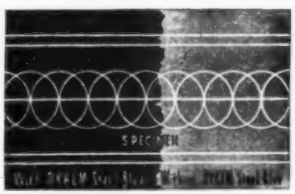

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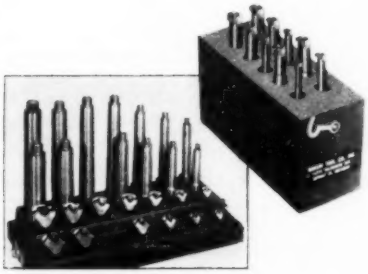

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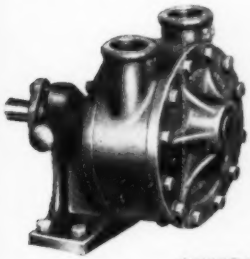

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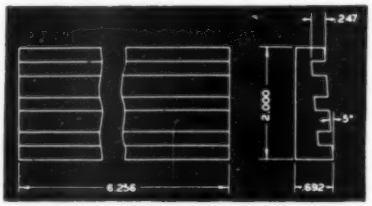

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Assure profitable production in threading small parts

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Cutter and work spindles are each driven by individual motor. This machine will cut from either brass or steel through a simple change in speed ratios. Cutters for any form of thread can be furnished by Waltham.

Standard equipment includes: point centers for head and tailstock, draw-bar for collet chucks, dog driving plate, 60° V cutter, 13 change gears, indexing device, lighting fixture and follow rest.

With work held on centers, threads 8¾" can be cut. With work held in draw-in collet, capacity is 10" length of thread. Diameter of hole through draw-in collet is ⅝". Swing over carriage is 3".

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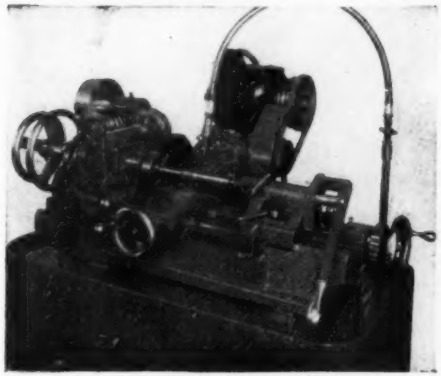

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Taper Bar, Lever Chuck Closer, Translating Gears, Climb Milling Device, Internal Cutter Head, Multiple Cutter Head and Collet Chucks.

WALTHAM MACHINE WORKS
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Die-Making Machines

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¾ SIZE

Operate at grinding-wheel speeds
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Cut hard materials - Rockwell 65-C

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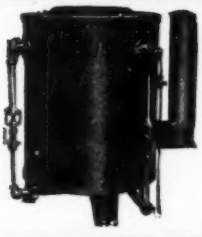
BUZZER *Gas Fired* **POT FURNACES**



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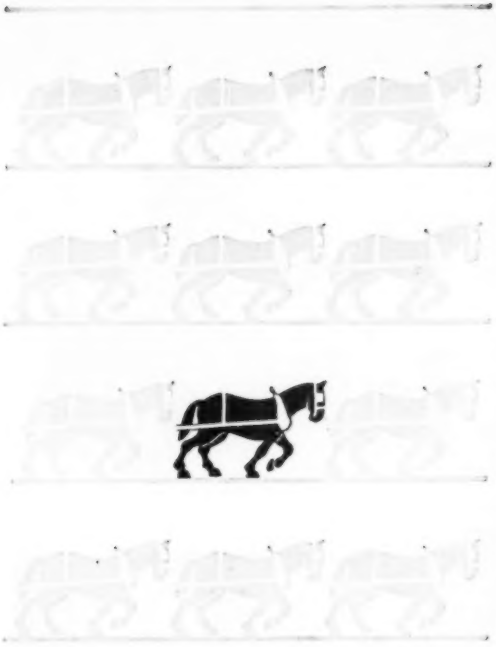

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Parco Cleaners remove the grease and soil—and act to condition the metal for the next step in the finishing operation. Now you can select a cleaner that helps you get economy and uniform, high-quality results with your finish.

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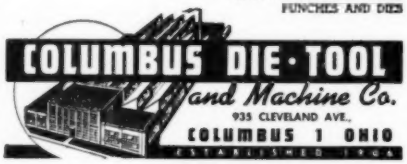

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. . . threaded pieces produced on the COULTER AUTOMATIC THREADING LATHE for standard, square and 29 degree threads, both internal and external, long or short.

Production Machines Since 1896

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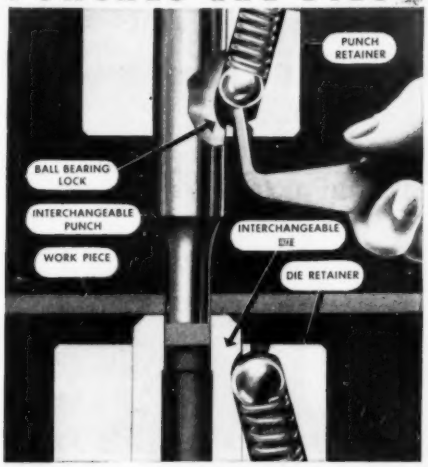

are *Simple,* TROUBLE-FREE *in* DESIGN *and* CONSTRUCTION

Any press operator can quickly and easily install and remove R-B punches and dies. Once inserted, however, they are securely locked vertically and radially by ball bearing locks for trouble-free performance on the press. Precision-made for perfect alignment and complete interchangeability, R-B punches and dies save time and money in die-building, reduce press "down-time" materially, and unlike most die-making parts, have a salvage value.

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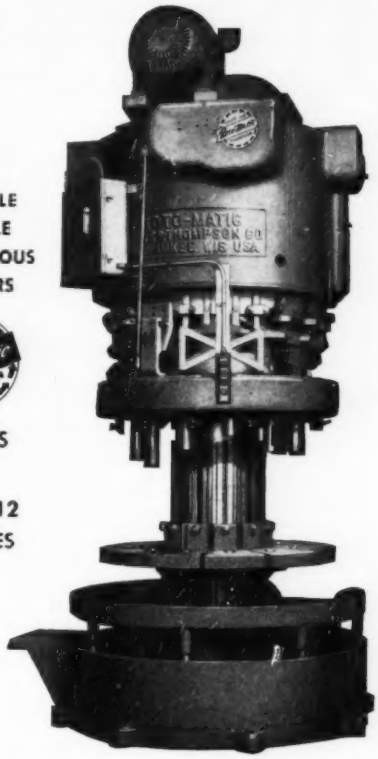
DAVIS and THOMPSON Roto-Matic

3 SIZES

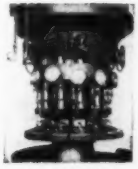
6-8 OR 12 SPINDLES



One Vertical ROTO-MATIC will equal the production of a whole battery of single spindle drillers with a proportionate reduction in labor and maintenance costs.

Where production demands fall below the capacity of the machine, on a single part, interchangeable fixtures can be designed for a variety of jobs. Where two operations are required on a single piece, requiring the same feeds and speeds, spindles can be arranged to give you the proper ratio of production.

2 SPINDLE DRILL HEADS



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MANUFACTURERS OF *Machine Tools*
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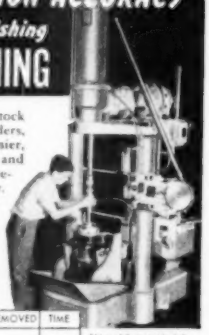
Get HIGH PRODUCTION ACCURACY on internal cylinder finishing with FULMER HONING

WITH Fulmer Honing Machines, stock can be removed from internal cylinders, ½" to 30" diam., much faster, easier, cheaper, than by any other method, and maintain high accuracy. Stock removal ranges over 90 cu. in. per hour. Hold to ± .0001" tolerances on bore size, straightness, roundness, with any desired surface finish.



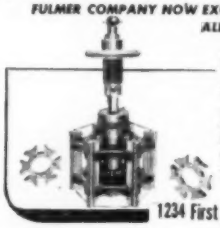
CHECK THESE TYPICAL PRODUCTION EXAMPLES OF FAST STOCK REMOVAL BY FULMER HONING MACHINES:

PIECE	LENGTH	DIAMETER	STOCK REMOVED	TIME
Hardened Pump Liner	27"	7.250" + .0005"	.015" — .018"	10 min.
Forged Gear Blank	Two 6" Bores	4.250" + .0002"	.005"	1 min.
Chrome Plated Diesel Liner	32"	8.500" ± .0005"	.004" — .006" of chrome	3 min.

(Above) Fulmer Model 10-25 honing 5⅝" bore aircraft cylinder, removing .006" of stock. Rate: 24 cu. per hour.

FULMER COMPANY NOW EXCLUSIVE U. S. DISTRIBUTOR FOR ALEXANDER BALL HONING TOOLS

Available in sizes from ½" to 30" diam.



FULMER Honing Machines offer the greatest value in the honing field. Write now for new, fully illustrated bulletin giving valuable data on honing applications, Alexander Ball tools, and specifications and construction details on all models of Fulmer Honing Machines. Send for your copy today.

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The Modern Way

Illustration shows typical set-up for cutting taper keyways with table tilted.

Machines are made in three sizes for keyways 1/16" to 1¼" in width.

Great simplicity and ease of operation of Davis Keyseaters assure the user of accurate, time saving work.

Let our engineer study your keyseating problems.

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Made by America's Largest Builders of Dividing Heads

ACCURATE AND LOW PRICED, TOO!

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Model SD 6½" Swing Universal Dividing Head for Smaller Milling Machines. Available for use with this head is the L-W 5" Universal chuck, threaded to fit . . . **$105.50**

Send for complete catalog giving prices and specifications on these quality, low cost L-W Products

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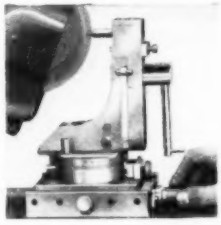

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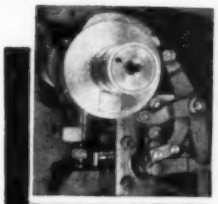

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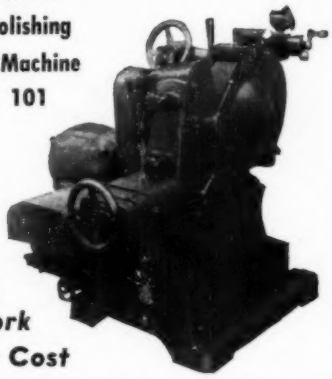

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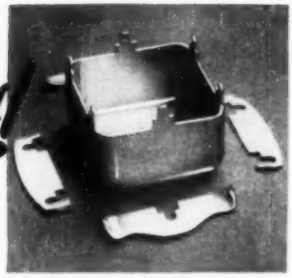

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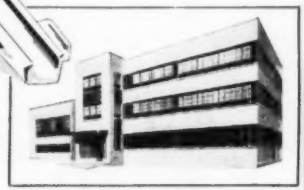

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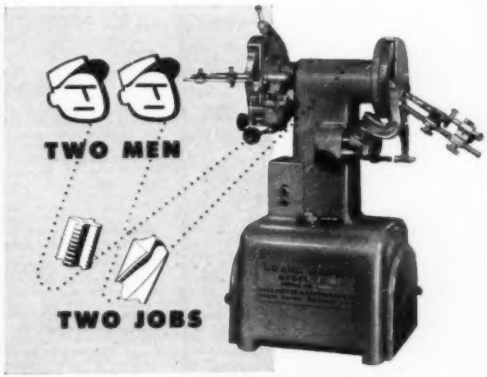

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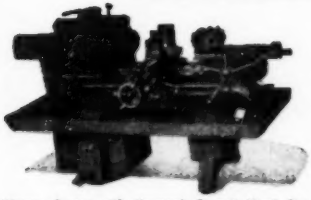

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Jones & Lamson #3 Univ. Bar Feed 1½"
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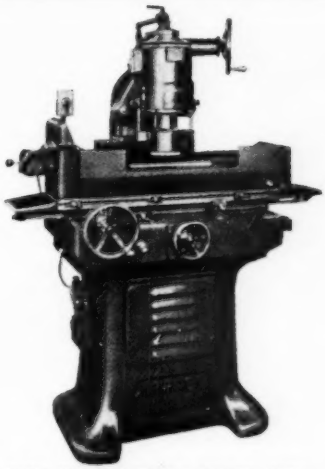

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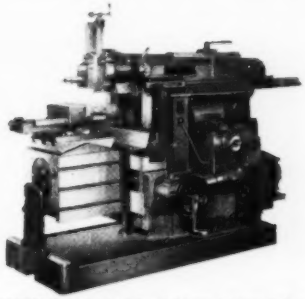
Blanchard #16 Vert. Rotary Surface. 26" dia. chuck. Power Vertical downfeed. Motor driven. Has built-in coolant system.
Thompson 6x18 Hydraulic Horiz. Surface. Wet & dry work. 220/440 motor driven. Auto. downfeed to head. Motor driven exhauster unit.
Norton 6x36 Horiz. Surface. 220/440 volts motor. Has extra grinding wheels and 40x9 chuck. For wet & dry work. Excellent condition.

AUTOMATICS

#0G & #00 Brown & Sharpe Automatic.
#2G Brown & Sharpe High Speed Automatic Screw Machine. Serial #6814. Self-contained 5 h.p. 3/60/220/440 volts motor drive & controls. Complete coolant, toolposts, gears, collets. FOUR AVAILABLE.
#2 Brown & Sharpe Automatic. Turner drive 220/440 volts motor. With Stock stands, collet, toolposts, coolant system, change gears. FOUR AVAILABLE.
Cleveland Model "A" 3¾" capacity Single Spindle Motor Driven Automatic. Has lot of tooling, collets, motors and switches & coolant system.

PUNCH PRESSES

O.B.I. Johnson (NEW) all sizes, geared & plain
O.B.I. Federal #3, 26 tons cap. motor dr.
O.B.I. Toledo #5, 44 tons cap. motor dr.
O.B.I. Bliss #18, 19C, 20, 20B, 21 motorized
O.B.I. Michigan, 36 tons cap. Wide ram & bed
Geared S.S.S.A. Bliss #305 Motor driven
Wheel Press, Niles, B & Pond Horiz. Hydraulic. 200 tons cap. 48" between strain bars
Stamping, Ferracute #86 Wide Frame, 61½" between housings. 12¼" stroke. Motor driven
Backflywheel, Ferracute #P4, 50 tons cap. 15"x 24" bed, 2" stroke. 220/440 direct gear motor drive w/controls.
Transfer, Nilson 56 tons S.S. Dble. Crank 3-Die.



GEMCO 20" Standard Duty Universal Motor Driven Shaper. (NEW) Power Rapid Traverse horizontal & vertical. 8 Cutting Speeds, 18 cross feeds. 5 h.p. 3/60/220/440 volts V-belt drive. With 12" Vise & set of wrenches. Immediate delivery.

SHAPERS

Shaper—Columbia 32" B.G. Crank, motorized Power downfeed to head.
Shaper—Logan 7" Horizontal. NEW
Shaper—Machinery Sales 16", motorized
Shaper—Smith & Mills 16", motorized
Shaper—Smith & Mills 16" Universal
Shaper—Gould & Eberhardt 16", motorized
Shaper—Gould & Eberhardt 18" B.G. Crank
Shaper—American 24" crank, motorized

MILLING MACHINES

Nichols Hand, Late Type, M.D. (six)
Hardinge B.B. Vertical, Bench
Becker #5C Vertical, Cone Dr.
Cincinnati #3, #4, #5 Pl. Horiz.
Brown & Sharpe #12 Production. 18" Autom.
Brown & Sharpe #12 Production. 24" Autom.
Brown & Sharpe #0, 1, 1Y Horizontal
Kempsmith #1, #2 Plain Horiz.
Cincinnati 18" Mfg. Plain
Milwaukee #2K Vertical, M. Dr. Dial Type
Milwaukee #3K Vertical, M. Dr. Dial Type
Milwaukee #1½ Dbl. Overarm, Horiz.
Milwaukee #2B Dbl. Overarm, Horiz.
Milwaukee #3B Plain Horizontal
Pratt & Whitney #2 Duplex, Motorized
#3 Dial Type, H.S. Cincinnati Vertical Mill. Power Rapid Traverse, speeds up to 1300 r.p.m. Range—34"x16"x16" Head has 6" vertical with four stop indicator. Serial #4A3V1L-61. Timken Bearing. 10 h.p. motor drive in base. Two available.

UNIVERSAL MILLING MACHINES

Ames Bench, 12" x 3" x 7½" W/Index Hd.
Index #40H, 16"x8½"x16"
B & S #2, 20"x5"x17½"
B & S #1½", 20"x7"x18"
Bridgeport, 20' x 9' x 16" Turret Type.
B & S #1D, 24"x8"x15"
Garvin #2MU, 24"x8"x18"
K & T "Milwaukee" #2, 28"x10"x17"
Kempsmith #2, 28"x8½"x18"
Cincinnati #2, 28"x10"x18"
Cincinnati #2M, 28"x10"x18"
B & S #3, 34"x10"x21"
Cincinnati #3S, 34"x12"x20"
Some w/index heads & equipment

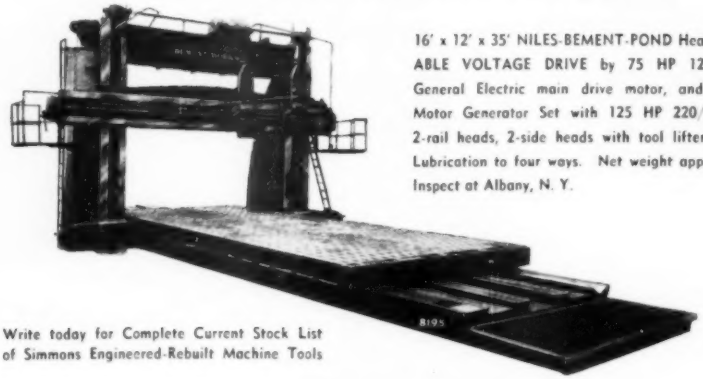
DRILLING MACHINES

American 4' Arm, 11" Col. Motor on Arm Radial. #5 M.T. has M. Dr. Coolant system.
Cinci-Bickford 6' Arm, 15" col. Radial
Cinci-Bickford 5' Arm, 13" col. Radial
Fosdick 5' Arm 14" col. Radial
Cinci-Bickford 3' Arm, 9" Col. Radial. Motor driven. W. table. 12 Speed gearbox.

SIMMONS ENGINEERED Machine Tool REBUILDING NEWS

SIMMONS MACHINE TOOL CORPORATION • MAIN OFFICE AND PLANT, 1759 N. BROADWAY, ALBANY, N. Y.

LOOK AT THIS HEAVY NILES PLANER!



16' x 12' x 35' NILES-BEMENT-POND Heavy Planer. VARIABLE VOLTAGE DRIVE by 75 HP 125/330/530 Volt General Electric main drive motor, and 75 KW G. E. Motor Generator Set with 125 HP 220/440 volt motor. 2-rail heads, 2-side heads with tool lifters. Forced Feed Lubrication to four ways. Net weight approx. 421,000 lbs. Inspect at Albany, N. Y.

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AUCTION

AT AUCTION—Stock of Marine Hardware Machinery & Equipment at

KENSINGTON SHIPYARD AND DRYDOCK

BEACH AND PALMER STREETS, PHILADELPHIA, PA.

TUESDAY, JUNE 14, 1949, AT 10 A.M.

DAYLIGHT TIME ON THE PREMISES

MACHINE SHOP—Universal 23½ Horizontal Boring Mills, Smith & Mills, Cincinnati and Ohio Shapers, 20" and 24", 10 South Bend, D. & E. and LeBlond Engine Lathes 14"x16' to 48"x30', D. & H. Open Side Planer 34, Kalamazoo Metal Cutting Band Saws, Newton 12" Vertical Slotter, Niles 84" Boring Mill, 3 Lodge & Davis Single Head Planers, Radial and Upright Drills, Electric Grinders, Arbor Presses, Tool Room Equipment, Landis and Oster Bolt and Pipe Threading Machines.

METAL SHOP—Niles 16" Open End Pyramid Type Forming Rolls, Motor Driven; Power 32" Heavy Duty Pyramid Type Motor Driven Forming Rolls, 23" and 18" Rolls; Hendley Forming Rolls 36" to 48"; Dreis & Krump Apron Brake 8'; P. S. & W. Bench Forming Tools, Hand Shears, Bench Brakes, Etc.

WELDING SHOP—15 Lincoln Portable Electric Arc Welders, 300 Amp., 2 G.E. 200 Amp. Portable Gas Driven Arc Welders, Welding Rod, Leads, Acetylene Cutting, Burning and Welding Torches, Gauges, Regulators, Hose, Etc.

HANDLING AND RIGGING EQUIPMENT—2 McMyler Interstate Steam Locomotive Standard Gauge Cranes, Shaw Box Electric Hoists, 1 to 8-ton capacity, Chain Hoists 1 to 10-ton capacity, 2 Crandall & Hicks Electric and Steam Driven Marine Railway Winches and Dry Dock Carriage, McKiernan-Terry Pneumatic Pile Driving Hammer, Manilla and Sisal Rope, Jacks, Chain, Shackles, Etc.

WOODWORKING SHOP—Powers, Colladay Band Saws, 36" to 40", Egan 16" Jointers, Colladay Shapers, Planers, Tenoning Machines, Wood Turning Lathes, Sanders, File Saw Equipment, Moulders Etc.

PNEUMATIC EQUIPMENT—Schramm Portable Gas Driven Air Compressor, Model 210, Ingersoll-Rand Duplex Electric Air Compressor, 15½x18, 324 H.P.; Pneumatic Riveting, Shipping and Caulking Hammers, Drills, Reamers, Impact Wrenches, Grinders, Air Hose, Stiff Leg Derricks.

MARINE HARDWARE, STEEL PLATE AND NON-FERROUS METALS—Brass, Bronze and Iron Gate and Globe Valves, Couplings, Propeller Shafts, Screws, Nails, Bolts, Nuts, Washers, Plate, Pipe, Pipe Fittings, Bar Stock, Metal Ingots, General Marine Hardware, Etc.

AUTO TRUCKS—Dodge Station Wagon, Dodge Ton Pick-up Truck, International Steel Open Body Truck.

MISCELLANEOUS—Blacksmith's Forges, Tongs, Retort; Oak and other Lumber, Steel Fuel Storage Tanks, 12M gallon capacity; Marine Paints, Primers, Rubber and Armored Electric Cable, Cork and Asbestos Insulation, Steel Lockers, Electric Hand Saws, Miscellaneous General Supplies for Steel and Wooden Vessels.

OFFICE FURNITURE—Oak and Mahogany Desks, Metallic Letter Files, Remington Rand and Underwood Typewriters, Underwood, Burroughs and Felt & Tarrant Comptometers, Drafting Tables, Electric Fans, Mimeograph, Electric Clocks, Addressograph, Graphotype, Etc.

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LATE TYPE MACHINERY AT OLD TIME PRICES

AUTOMATICS

Brown & Sharpe #00G, H.S., #4, #6
Conomatic 8 sp. 1⅞" cap.
New Britain Gridley 6I—6 Sp. 2¼"

BORING MILLS

Bullard, 42" New Era V.T.L.
Giddings & Lewis #0, #25T
Lucas #31 horiz.
Universal 3" horiz.

DRILLS AND RADIALS

American Hole Wizard 3'-9" col., Amer. 4'-13" col
Barnes #262, 26"
Canedy-Otte 3'-9" col.
Carlton 8'-19" col., Foote-Burt 6 Sp.
Cinci-Bickford Super Service, 21", 24"
Delta Bench & Floor Models single & 4 spindle
Natco Model E-5 Multi-Spindle, 14 spindles
Royersford Excelsior 21" Back Geared, P.F.
Sibley 24—28", Sliding Head, Allen 6 Sp.

ENGRAVERS

Gorton #3U, 3Z 2 dimensional; #3L, 3 dimensional
Gorton Cutter Grinders 375-2, 265-5
Priess JE Bench

GEAR EQUIPMENT

Fellows #72, 725 High Speed
Mikron Gear Hobber
Michigan, Gleason Checkers

GRINDERS—Miscellaneous

Black Diamond #1 Drill
Brown & Sharpe #5 cyl., 3"x18"
Brown & Sharpe #1, #2, #3 Univ., #13 Univ. & Tool
Cincinnati #2 Centerless Filmatic, 12"x36, 12x48" Univ.
Covel #91A Univ. Tool & Cutter, Hammond #4 Carbide
Gardner #226, 30" disc, Heald #1 Tool
K.O. Lee Tool & Cutter
Landis #4H Cyl. 4x12", Landis #6 Thread, Centerless
Norton #2 Tool & Cutter
Norton Cyl. 6x18" Type C, 6x30" Type C
Oliver #510 Drill Pointer, Sellers #4G
Pratt & Whitney Radius #R6, Grenby Int.
Porter Cable Belt WG8, G8

GRINDERS—Surface

Abrasive #1½" Wet Hand Feed, #34 Vertical
Atlantic 6x18" Power Feed, Foote-Burt Hammond
Blanchard #18—42" Chuck
Brown & Sharpe #2, #5 Hyd. 8x24" Cap.
G. & L. #18, 6x18" Hand Feed, #25, #35 Hyd.
Hanchett #300, 13x48"
Mattison 14x16x48 Hyd.
Norton 6x18" Hyd.
Pratt & Whitney 12x36" Vert.
Reid #2A P.F., #2C Pope & Excello Spdl.
Thompson Hyd. 6x10x18", 6x12x18

LATHES

Bradford 16"x6'
Hardinge Precision 9", cabinet
Hendey G.H. 16x30 Relieving Attach.
LeBlond Regal 10"x3½", 15x30", 19x48", 21x60"
LeBlond Heavy Duty 16x33"
Lodge & Shipley 10x78" T.A.
Monarch 10"x20" EE, 16x78" T.A., 12x30" CKK
Rivett Precision, Logan 10"x30"
South Bend 9"x3', 9"x3½', 13x36", 14"x6'
Sebastian 12"x4', G.H., Sheldon 11x24, 1" collet
South Bend 10" Toolroom 1" collet capacity, T.A.

LATHES—Turret

Acme #6W Bar & Chuck, 6W Fox Lathe
Bardons & Oliver #3, #5, Foster #3B
Brown & Sharpe #1, 2F Hand Screw Mach.
Gisholt #4, 5 Bar & Chuck
Hardinge ESM Second Operation
Jones & Lamson #8A Univ. Saddle Type
Oster #601 Rapiduction, Morey #3, 1½" cap.
Warner & Swasey #3 Universal, #4 Pre-Selector, & #4A—8" Bar Cap. 1947

MILLS—Plain & Universal

Brown & Sharpe #2 Pl., #2A Univ.
Burke #4 Plain & Univ., Vert. Hds
Cincinnati #3 Plain, 2MH Univ., Dial Type
Milwaukee #2HL, 2H, Plain H.S.D.T.
Milwaukee #2HL, 2H, 3H Univ. H.S.D.T.
Van Norman #12, 20, 22L, 36

MILLS—Vertical—JIG BORERS

Bridgeport vertical with Slotting Attach.
Brown & Sharpe #2, Index Vernon
Cincinnati #4 Dial Type, Jackson
Kearney & Trecker #5H, 3H High Speed
Gorton #8D, 9J Plain
Gorton #8½D Duplicator Fully Equipped
Fosdick Jig Borer #42 Like New 1947
P&W 1½B Jig Borer
Sip Jig Borer #MP-5
Moore Jig Grinder
Morey #12M Profiler 2 sp.—Pratt & Whitney 12B

MILLS—Production

Brown & Sharpe #000, 12, 2I
Cincinnati #1-12, 1-18, 2-18 Mfg.
Kent Owens #1V
Nichols Hand, Vert. Hd., U.S. MM 1
Sundstrand #00 Rigidmills, U. S. Duplex

PRESSES

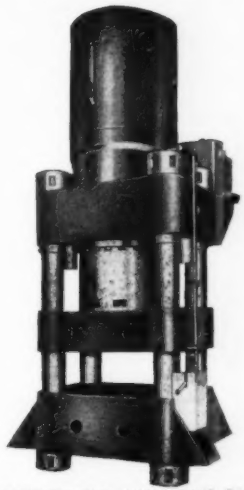
Bliss #8 Dbl. Crank, Bed 42x100", 250 Ton
Bliss #675, 645B, 650 Hi-Production
Bliss #20, 21 O.B.I., #4½ Double Action Cam
Bliss #58 O.B. Gap Frame #62, 62A, 162
General Flexible Elec. Screw
Henry & Wright 25, 60, 75 Ton Dieing
Thomas 7A, 80 Ton O.B.I.
Toledo 400 Ton Knuckle Joint #663
V. & O. #25B O.B.I., #102 Reducing
Z & H 30 Ton O.B.I.

MISCELLANEOUS

BAND SAW: DoAll Metalmaster, Tannewitz #36M
BENDING ROLL: Buffalo #0, Excelsior #14
BROACH: 3L LaPointe Horiz. Hydr.
FILER: Oliver, HEAVY DUTY
HACKSAW: Marvel #6A Automatic, #6, #4B
HARDNESS TESTER: Clark
HAMMER: Niles Bement Pond 2500 lbs. steam
HAMMERS: Rochester Rivetting, Hi Speed, Grant
HONER: Micromatic #H-1 Hydrohoner, Sunnen
INJECTION MOLDER: Reed-Prentice #10D6, 6 ounce

NEW IN STOCK

Air Hydraulic Presses—Arbor Presses #6C Famco, ⅓ off list price—Band Saws Kalamazoo 8x16", 8x24"—Drill Presses all sizes—Grinder Surface, Abrasive #1½"—Hydraulic Press Northern 20 Ton — Injection Molders, 1 ounce — Power Presses, Famco 4½, 7½ Ton, Rousselle O.B.I. & Horn 5, 10, 15, 25 Ton, Pressrite OBI, 5, 10, 12, 18, 30 ton sep.—Shaper, 7" Ammco, 8" Shaprite, Sheldon 12"—Shears Foot 22" to 8', 16 & 10 ga., Shears, Power, 3'x18 gauge to 10 x 10 ga.—Welders, Arc, Seam, Spot all sizes—Vert. Milling Attach. Haloo, HS 5 & 10 Speed—Motors, Grinders, Buffers, all sizes.



SELF-CONTAINED HYDRAULIC PRESS

HYDRAULIC EQUIPMENT

Cap.	Manufacturer	Platen	Stroke	Opening
500 Ton	Lake Erie	35x36"	36"	60"
600	Bald. S'thw'k	76x59"	22"	36"
500 D.A.	H.P.M. (160 Cushion)	36x36"	24"	36"
1000	French Oil	53x42"	20"	50"
300	Brand New Watson Stillman Hobbing Press			
275 D A	Elmes (60 Cushion)	84x44"	12"	42"
350	Verson	40x40	36"	72"
50	Dennison	22x20	16	28
150	Southwark	34x30	30	2' to 4'

UP MOVING RAM PRESSES

50 & 100 Ton Stokes Molding Presses & Pumps
300 Ton Dunning & Boschert Molding Press
500, 800 Ton Waterbury-Farrel 3 & 4 Rod Presses, 6 & 6½" strokes
300 Ton Watson Stillman Press, 24x20" Platens
400 & 500 Ton Shaft Straighteners—Self Contained

All Hydraulic Equipment is completely engineered and checked by a competent staff, thus assuring reliability. Send us your Hydraulic problems.

IRONWORKER: Buffalo 25U x 20 Univ.
KEYSEATER: Mitts & Merrill, Baker Davis
PRESS BRAKE: #253, #335 Chicago
ROUTER: Onsrud #W240, #55 Oliver
SAWS: Wells, Catskill, Kal.
SHAPER: 8" Shaprite, Ammco, Atlas
SHEAR: Pexto, 6'16 Ga. Power, 6'x16 Ga.
SHEAR THROATLESS: #138 Lenox
SPEED LATHES: Cincinnati, Schauer
TAPPERS: Bakewell #1, Haskins #2C, 3C
THREAD ROLLER: Waterbury-Farrel #30 with Dies
THREADERS: Oster Pipe #304 & Bolt 542A
WELDERS: Seam; Thompson
WELDERS SPOT: Taylor-Winfield 50 KVA, Sciaky
WRAPPING ROLL: Buffalo #½

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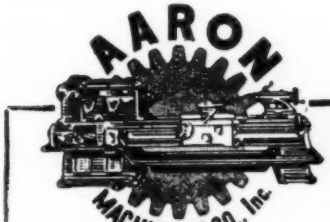

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Type A Barber-Colman, m.d., late type
No. 12M Gould & Eberhardt Universal, m.d.
No. 34 Brown & Sharpe, m.d.
No. 3690 Gould & Eberhardt, m.d., with infeed attachment for worm gears
No. 44 Brown & Sharpe Spur & Spiral, m.d.
48" Cleveland, m.d.

GEAR CUTTERS

No. 3-26" Heavy Brown & Sharpe, m.d.
No. 4-48" Brown & Sharpe, m.d.
Gleason Spiral Bevel Gear Rougher, s.p.
3" Gleason Straight Bevel, m.d.
8" Gleason Straight Bevel, m.d.
11" Gleason Straight Bevel, m.d.
12" Gleason Straight Bevel, m.d.
Cincinnati Gear Burnisher, m.d.
No. 1 Brown & Sharpe Spur Gear Tester
Cross Gear Tooth Rounder, m.d., 9" cap.
National Broach & Machine Co. Red Ring Gear Speeder, 10" cap.
Gleason Gear Tester for hypoid gears

CENTERLESS GRINDERS

No. 2 Cincinnati, m.d., Filmatic Spindle, latest
No. 2 Cincinnati, m.d., older type
Long bar attachment for No. 3 Centerless
Cincinnati Valve Seat Grinder, cap. ⅝" valve stems, m.d.

CYLINDER GRINDERS

No. 50 Heald Hydraulic, m.d., 11-18" spindle
No. 55 Heald, m.d., 15-24" spindle
No. 73 Heald Airplane Cylinder Grinder, m.d., brand new, latest type

PLAIN CYLINDRICAL GRINDERS

No. 5—3x18" Brown & Sharpe, m.d., latest
5x18" Cincinnati Hydraulic, m.d.
6x18" Landis Type C Hydraulic, m.d.
6x18" Landis, m.d.
6x30" Cincinnati Hydraulic, m.d.
8x32" Fitchburg Type A, m.d., late
8x18" Cincinnati Saddle Type, m.d.
8x36" Cincinnati Saddle Type, m.d.
No. 10 Brown & Sharpe Self-Contained, m.d.
No. 11 Brown & Sharpe Self-Contained, m.d.
10x24" Landis, m.d.
10x36" Cincinnati Hydraulic, m.d.
10x48" Brown & Sharpe, belt
10x72" Brown & Sharpe, belt
10x72" Landis, m.d.
12x36" Landis, m.d.
12x48" Cincinnati Plain Self-Contained, m.d.
12x48" Cincinnati, with spline grinding attach.
12x48" Modern, belted m.d.
12x96" Landis, m.d.
14x18" Cincinnati Self-Contained, m.d.
14x48" Cincinnati Plain Self-Contained, m.d.
14x52" Norton, motorized
16x48" Landis Type D, m.d., latest
20x120" Landis Self-Contained, m.d.
26x96" Landis Self-Contained, m.d.
50"x192" Cincinnati Traveling Wheelhead Roll Grinder, Brand New

UNIVERSAL CYLINDRICAL GRINDERS

6x20" Fitchburg Hydraulic Spline & Gear Grinder, m.d., latest
12x24" Cincinnati Self-Contained, m.d., latest mechanical type
No. 2—12x30" Brown & Sharpe, belt
12x30" Landis Hydraulic, m.d., late type
12x36" Cincinnati Self-Contained, m.d.
12x36" Cincinnati, belt
12x48" Cincinnati, arranged for spline grinding
12x48" Cincinnati Hydraulic, m.d., latest type
12x18" Norton, m.d., latest
16x48" Cincinnati, belted m.d.
18x48" Cincinnati Hydraulic, m.d., latest

INTERNAL GRINDERS

No. 16A—16" Bryant, m.d., latest
No. 16—22" Bryant, m.d., latest
No. 16RS Bryant, m.d., latest
No. 16—38" Bryant, m.d., latest
No. 6, 9, 10, 20 Bryant, belt
No. 24—21" Bryant, m.d., late
No. 24—36 Bryant, m.d., latest
No. 49 Heald Single End Borematic, m.d.
No. 70 Heald, belt
No. 72A Heald Plain, m.d.
No. 72A3 Heald Sizematic, m.d.
No. 72A3 Heald Gagematic, m.d.
No. 72A5 Heald Plain, m.d.
No. 72A5 Heald Plain, long bed type, m.d., latest
No. 73 Heald Airplane Cylinder, m.d., brand new, latest
No. 74 Heald, m.d.
No. 172 Heald Gap, m.d., brand new, latest type
No. 175 Heald Gap, m.d., latest
No. 649-16 Van Norman Automatic Oscillating Radius, m.d., latest
Series 5, No. 5 Bryant, m.d., latest

SURFACE GRINDERS

No. 3 Abrasive, m.d.
No. 76 Van Norman Automatic Piston Turning and Grinding Machine, m.d.
Arter Model A-1-8" Rotary, m.d.
No. 11 Blanchard Rotary, m.d., latest
No. 16 Blanchard Rotary, m.d., 26" chuck
18x18x60" Thompson Hydraulic, m.d., late
No. 22—12" Heald Rotary, m.d., latest
No. 22—12" Heald Rotary, m.d.
No. 25A—24" Heald Rotary, m.d., latest
No. 25A—16" Heald Rotary, m.d., latest
No. 33 Abrasive Vertical, m.d.
No. 260—16" Heald Rotary, belt
10x12x60" Norton Hydraulic Surface, m.d., latest
14" Pratt & Whitney Vertical, m.d.
22" Pratt & Whitney Vertical, m.d.
54" Bridgeport Knife, belt

THREAD GRINDERS

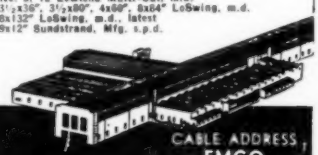
No. 33 Excello Precision, m.d., latest
No. 39A Excello Internal Thread, m.d., latest

TOOL & CUTTER GRINDERS

No. 13 Brown & Sharpe Universal, m.d., latest
No. 2 Cincinnati Universal, m.d., latest
Cincinnati Monoset, m.d.
Sterling Tool & Cutter, m.d.
Gleason Cutter, m.d.
No. 2B Sellers Drill, m.d.
No. 12M Grand Rapids Tap, m.d.
No. 4T Sellers Tool, m.d., latest
No. 2 Norton Universal Hydraulic, m.d., latest

MANUFACTURING LATHES

No. 4 LeBlond Boring Lathe, 37" bed, 13" hole
No. 9, 12 LeBlond Multi-Cut, m.d.
3½x36", 3½x80", 4x50", 8x84" LoSwing, m.d.
8x132" LoSwing, m.d., latest
9x12" Sundstrand, Mfg. s.p.d.



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NEW *SURPLUS*

SLOCOMB MICROMETERS

0-1"	$5.00
1-2"	6.00
2-3"	7.00
3-4"	7.50
4-5"	7.50
5-6"	7.50

UNION SCALES

6" Scales, #4 Union, ¾" Wide, Hardened, 8ths, 16ths, 32nds, 64ths, $.40 each, $4.00 per dozen.

VICTOR MACHINERY EXCHANGE INC.
251 CENTRE ST.
NEW YORK 13, N. Y.
CANAL 6-5575

UNUSUAL VALUES

Milling Machines—No. 1, Universal, No. 1 American (new) plain, No. 1 Vertical.

Drills—Large selection, single and multiple spindles also bench types, many of them new.

Gear Cutters—Brown & Sharpe No. 3—26" Gould & Eberhardt 42".

Grinders—Cylindrical B & S No. 11, Planer type 16"x36", Surface 13"x63", also new (small) Universal bench and floor type. All with coolant, motorized.

Lathes—14"x6', 8', 10'—10"x6', 8', 10'—18"x6', 8', 10'—26"x16'—all cone drive, several motorized also (new) 18"x8' and 10' geared head, motorized.
Large stock 19" and 18" bench and floor type.

Planers—Single head 24"x6', 24"x8', 26"x8'.

Shapers—16", 20", 24", B.G. crank.

Turret Lathes—J & L 2"x24"—3"x36" also Acme, W & S Turret (vertical) boring and facing mills, 5 hole turrets, 30", 40".

SPECIAL—New totally enclosed dust proof, fan cooled, ball bearing saw arbor motors, plain shafts to size or threaded, and with collars, measures only 3¼" from center of shaft to flatted top (1 h.p. to 15 h.p.) 2 or 3 phase, 3600 r.p.m.

WOOD WORKING MACHINERY—A very large stock of new and re-built, practically all motorized. New Motorized overhead cut-off and miter saw for wood, plastics, steel, aluminum and other metals. The above list is only a fraction of our stock which changes almost daily, therefore, tell us definitely what you want since we are adding considerable number of machines to our stock which are too many to list. What we have today may be sold tomorrow, so a list is really not dependable.

Drill—Foote-Burt No. 25 24" Hi Duty 3" capacity in steel. Motor attached.

PATTERN MAKING MACHINERY—42"x16' bed wood lathe, compound rest, rack and pinion feed to carriage; 16" heavy duty jointer, extra long bed, front table tilts for giving draft to pattern work; tilting table also tilting arbor rip and cut-off saws; band saws; jointer; floor and bench type trimmers; and also many other machines for pattern work.

THE OSBORNE & SEXTON MACHINERY CO.
P. O. Box 88, Columbus 16, Ohio

ALL PRICES DRASTICALLY REDUCED!!

All Late Type

#72A3 HEALD Gagematic, Internal Grinder, Serial #15585—$1900.00
#16A BRYANT Internal Grinder, Serial #P6041—$1900.00
15½" GRENLEE, Six Spdl. Auto., Serial #A942—$4000.00
18½" swing MONARCH Lathe, Serial #17216—$4600.00
14x36" BROWN & SHARPE Univ. Grinder, Serial #2682—$3600.00
#12 BROWN & SHARPE Production Mills, 48"x12" tables Serial #'s 3646—$2100.60 ea.
5 Ton SHEPARD & NILES Crane, 27' Span, cheap!
All above with A. C. motors.

HAND BRAKES

Immediate Delivery, Brand New

10' 18 ga. $440.00
6' 18 ga. 249.00
4' 16 ga. 185.00
All steel construction. Sizes available from 4', Prices f.o.b. factory.

2803 Ton BLISS HYDRAULIC, 3 column type 12" stroke, 115" dia. bed, 1942 model, for sale, less than ½ cost.

#305 BLISS PRESS, 12" stroke 1941—$3650.00
25% OFF LIST PRICE

SPOT WELDERS, air operated or foot operated, brand new, fully guaranteed nationally known manufacturer. Example: Present factory price $281.00 for 5 KVA, our special price $217.00.

MDNA MEMBER

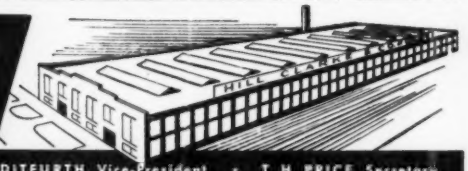
PAULS MACHINERY COMPANY
6111 Vermont Ave. — Detroit 8, Mich.
Phone TYLER 7-6300

PRACTICALLY NEW

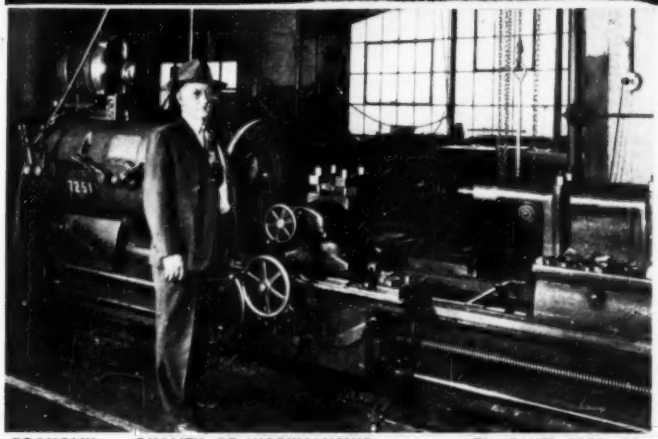
Type "T" Barber Colman Hobbing Machine. Complete with all gears, tangential feed. Serial No. 125
Excellent Mechanical Condition
PRICE $6,750.00

WINSTON MACHINERY CO., INC.
517 S. Delaware St., Indianapolis 4, Ind.

HILL-CLARKE MACHINERY COMPANY



ESTABLISHED 1867 • H. W. MONS, President • W. L. DITFURTH, Vice-President • T. H. PRICE, Secretary



ECONOMY — QUALITY OF WORKMANSHIP are reasons The BAUER BROS. CO., Machinery Manufacturers, Springfield, Ohio look first to Hill-Clarke for dependable used machine tools. EDWARD A. ULLIMAN, SUPT. pictured beside a 36" Lodge & Shipley Lathe purchased from Hill-Clarke.

AUTOMATICS

No. 2 Brown & Sharpe
1⅝" Greenlee, 6 Spdls. (1941)
No. 61 New Britain 6 Spdls. 1⅝" (1942)
No. 6 Brown & Sharpe
No. 49 New Britain, 4 Spdl. chucker
Model A 2½" Cleveland (1943)
Model A 3¾" Cleveland (1942)

DRILLS

No. 150 Baker
No. D8 Colburn, No. 6 Morse Taper
No. 1LMS—20"—5 Spdle. Leland-Gifford
No. 2LMS—26"—1 Spdl. Leland-Gifford
No. 2LMS—14"—3 Spdl. Leland-Gifford
No. 2LMS—28"—4 Spdl. Leland-Gifford
No. 2LMS—28"—6 Spdl. Leland-Gifford
No. 4BL Natco 36 Spdl.
6'-17" Col. Fosdick Radial
7'-15" Col. American Full Universal

GEAR MACHINES

No. 61-A Fellows Gear Shaper
No. 7125 Fellows (1943)
No. 712 Fellows Auto Indexing (1943)
No. 72 Fellows Gear Shaper
No. 16 HS Gould & Eberhardt
No. 18H Gould & Eberhardt
No. 6 Gleason Gear Tester
12" Gleason Bevel Gear Cutter
72" Cincinnati Gear Cutter

HORIZONTAL BORING MILLS

No. 31 Lucas, 3" bar
No. 46-B Heald Bore-Matic
No. 112—C Excello 2 Spdl.

GRINDERS

3"x12" Brown & Sharpe No. 5 (1944)
4"x12" Landis, Model H (1942)
6"x18" Norton Type C Plain (1943)
6"x30" Norton Type C Plain (1943)
10"-14"x36" Norton Type C Plain (1942)
10"x18" Norton Type C Plain (1943)
10"x48" Norton Type C Plain (1943)
Norton Motorized Grinders ranging from 6"x18" to 24"x240"
18"x48" Mattison Hyd. Surf. Gdr. (1942)
No. 5—8"x24" Covel Hydr. Surf. (1941)
No. 36-A Hanchett Rotary Surface
18"x49" Mattison (1948)
72A-3 Heald Internal Grinder (1942)
72A-5 Heald Internal Grinder (1942)
74 Heald Internal Gdr. (1942)

FOR YOUR PROTECTION only Hill-Clarke offers THIS 5 WAY GUARANTEE

1. A responsible organization—82 years experience.
2. A 58,000 sq. ft. plant equipped with complete and modern facilities plus experienced craftsmen for remanufacturing machine tools.
3. Modern machines—no worn out equipment.
4. You can see your machine tested under power before purchasing.
5. Hill-Clarke's unconditional money-back guarantee.

No. 5 Bryant Internal Grinder (1942)
No. 16-16 Bryant Internal Grinder (1942)
No. 16-36 Bryant Internal Grinder (1942)
No. 24-26 Bryant Internal Grinder (1941)

LATHES

15"x5' Sebastian, Grd. Head
16"x54" centers LeBlond (1941)
16"x60" centers Pratt & Whitney, Model B
18"x6' American, Grd. Head
19"-38" gap x 10' LeBlond
36"x30' Lodge & Shipley
36"—48"x16' Lehman Hydratrol (1945)
50"x17' centers LeBlond (1942)

LATHES (Production)

8"x15" Sundstrand, Model D (1943)
10"x16" Sundstrand, Model D (1942)
10"x22" Sundstrand, Model AA (1943)
16"x33" Fay Automatic (1942)
20"x25" Fay Automatics (1942)
R—14 Seneca Falls Lo-Swing

MILLING MACHINES

No. 2 SP Van Norman Plain (1942)
No. 4 Cincinnati Plain (1943)
No. 2 H Milwaukee Vertical (1942)
No. 2 Cincinnati Vert. (1942)
No. 2M Cincinnati Vert. (1941)
No. 3 Cincinnati H.P. Vertical
Linley Vert. Miller No. 1 U. S. Hand Miller
No. 1-18 Cinn. Mfg. (1940)
No 2—18" Sundstrand-Electromil (1942)
No. M-24 Milwaukee Simplex (1942)
38"x40"x10' Fitchburg Duplex Miller (1943)
No. 4-48 Cincinnati Hyd. Tracer (1942)
No. 34-48 Cincinnati Hyd. Duplex
No. 45-48 Cinn. Hyd. Duplex
No. 48-72 Cincinnati Hydromatic (1942)
No. 56-72 Cincinnati Hydromatic
4½"x12" Pratt & Whitney, Model C
4"x9" Hanson-Whitney Univ. Thrd. Miller
6"x36" Lees-Bradner—Model HT (1943)
6"x48" Pratt & Whitney Thrd. Miller
6"x80" Pratt & Whitney Thread
6"x132" Pratt & Whitney Thread Miller
6"x168" Pratt & Whitney Thread
10"x48" Hanson-Whitney Thread
24"-24"x12' Ingersoll Adj. Rail
36"x36"x16' Ingersoll Slab Miller
No. 10 Ingersoll 72"x6' Travelling Col. Face Millers (1942)

MISCELLANEOUS

18" Dill Slotter
Model H-7 Micromatic Hydro Honer
Model H-2 Micromatic Hydro Honer
Model 200 Micromatic Hydro Honer
8-M Wells Band Saw
Model H-100 Micromatic Hydro Honer
Model 200—HS Micromatic Horiz. Hone
No. 2 V & O open back press
Baush Radial Tapper (1942)
No. 304 Bliss Press

PLANERS

36"x36"x12' Cincinnati
36"x36"x18' Gray, 4 Heads
48"x36"x14' Gray
48"x48"x12' Cincinnati, 4 Heads

TURRET LATHES

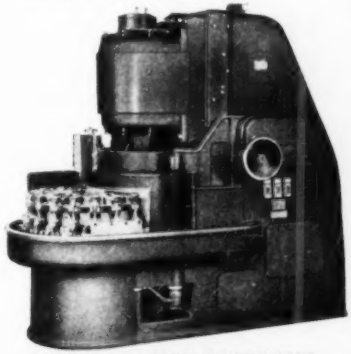
No. 4 Gisholt Univ. Turret Lathe (1942)
No. 4B Libby, Bar Feed (1942)
No. H-5 Libby
No. 5 Bardons & Olivers (1942)
No. 5 Midland, Bar Feed (1942)
No. 2-A Warner & Swasey
No. 1-H Libby, 6¼" Hole in Spindle (1937)
No. 1-H Libby, Extra Long Bed (1942)
18" Libby, 3½" Hole in Spindle
No. 4A Warner & Swasey, 7½" Hole in Spindle

VERTICAL BORING MILLS

42" Bullard New Era
42" Colburn
60" Colburn
72" Niles Extra Heavy
84" Betts

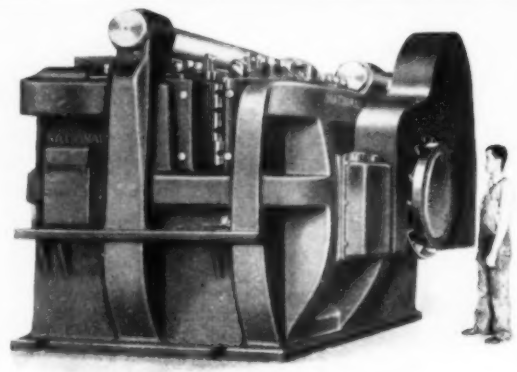
FEATURE OF THE MONTH

This late model No. 36 A. Hanchette Automatic Rotary Surface Grinder gives you extra high production with savings in purchase cost. Inspect it at our plant now.



Ask for our NEW GREEN LIST

Write, Wire or Phone **HILL-CLARKE MACHINERY COMPANY**
651 WASHINGTON BOULEVARD, CHICAGO 6, ILL. PHONE CEntral 6-0500



NATIONAL
4-INCH HIGH DUTY
FORGING MACHINE
LATE TYPE, SERIAL #14482

- Suspended Header and Die Slides.
- Air Friction Clutch . . . Wt. 130,000#.
- Cam Operated Die Slide with Auto Relief.
- Motor Driven with 50 H.P.—3/60/220/440 V.
- Recently Overhauled including New Crankshaft.

THREADING MACHINES

1—2½" Model XL 2 Spdl. Hill Acme—Lead Screws—1945 machines—Rebuilt
1—⅞" Landis 1 Spdl. with Lead Screw
1—1" Landis Standard with Lead Screw
1—Landis "Landmaco" Threader—1943 Machine—Like New—Without Lead Screw

BOLT MACHINERY

1—1" 8 Spdl. National Semi-Automatic Nut Tapper Equipped With Ringlock Chucks

1—Manville #2 DSOD Cold Header—Rebuilt
1—Waterbury-Farrel SSSD Hi-Speed Ball Header
1—Waterbury-Farrel ¼" Rod & Spoke Header
1—Kingsbury 4 Spdl. Pin Drilling Machine
2—½" Economy Bolt Pointers—Automatic

FORGING EQUIPMENT

1—1" National Hi-Duty Suspended Slide Upsetter
1—100# Bradley Cushioned Helve Hammer—Rebuilt
1—300# Bradley Upright Helve Hammer

MISCELLANEOUS

1—#1 Gisholt Turret Lathe, Air Operated Bin feed—Preselector Head—1945 Machine
1—#4 Williams & White Hi-Speed Bulldozer
1—#12D Moline "Hole Hog" Multiple Drill Press—No. 5 M.T.—12 Spindles
1—Buffalo Cold Rolling Mill—Dia. of Rolls 4"—Face of Rolls 6"
1—#16 Bliss Horn Press—Motor Driven
1—2" and 4" Bignall & Keeler Pipe Threader—M.D. Landis Heads
1—15 H.P. Schramm 50 C.F.M.—Air Compressor—One week's usage

STROM-JOHNSON MACHINERY CO.

8800 SOUTH VINCENNES AVE.
CHICAGO 20, ILLINOIS

McDONALD
USED MACHINERY

G & E 24" Cin. 32" Shapers
Cleveland O.S. Planer 36"x8', 2 hds.
Abrasive No. 34 M.D. Vert. Surf Grinder
Cincinnati D. H. Planer 36"x36"x10', 2 hds.
Monarch 20" grd. hd., M.D. Lathe 16 sp. Speeds Model "M"
Bulard Vert. Turret Lathes, 24" & 36" S. Head
Defiance 3" Horiz. Boring Mill & Univ. No. 3-A
L & S 18x12' & 20'x10', 20'x8' Grd. Hd., M.D. & 28"x12' Lathes Monarch Model "C"
American 24x12 grd. hd. lathe, m.d. q.c.g.
American 4-ton vert. Hydr. Broach
Blanchard Vert. Surf. Grinder, 26 rd. chuck
Cincinati No. 2 Centerless Grinder
Colburn 60" & 72" Vert. Boring Mills
Cincinnati 1-M grd. hd., Univ. tool room Miller.
Cincinnati No. 5 H.P. grd. hd, S.P.D. Pl. Miller.
W. & S. No. 2A grd. hd, Univ. Turret Lathe, S.P.D.
Foster No. 2F Ostermatic grd. hd. Turret Lathe, M.D.

MONA MEMBER

McDONALD MACHINERY CO.
1531-35 No. B'way., St. Louis 6, Mo.

LATE DIE SHOP TOOLS

28-60 Cinci. Hydrotel, one spin., 1943
BL 2416 Keller 3 spin. Duplicator, table 22"x42", 3 dimensional
Model 375-2 Gorton Tool Grinder
Model 9J Gorton Electric Duplicator, 3 dimensional
Model 9J Gorton Vert. Miller, power feed to head
Bridgeport Vert. Miller, power feed, shaping attach.
(2) Bridgeport Vert. Millers
#3K K. & T. Plain Miller, with vert. attach. & Rotary table
3 9" col. American Hole Wizard Radial
#45 G. & L. Surface Grinder, 12"x24"
16" G. & E. Tool Room Shaper, 1943
#2 B. & S. Surface Grinder, 1943
Cinci. Monoset Grinder
(2) 9" Hardinge Bench Lathes
24" Foote Burt Drill, #2 M.T.

BENNETT MACHINERY CO.
30 Church St., New York 7, N. Y.

AUTOMATICS—Natl. Acme 1⅝", four spindle, Bargain (2).
GRINDER—(Rotary) Blanchard 25" mag. chuck, belt—$560.00
HYDROHONER—Micromatic Model #4H (1943)
LATHE—Bambe d-Chase Tool Room, 14"x6' Taper, Late.
Bridgeford, Engine, g. head, 32"x21' centers.
MILLER—Plain K. & T. #4K, Late.
PLANER—Cleveland Openside 60"x60"x20', Late. Niles Bement Pond 48"x48"x26', 4 heads.
PRESSES—(2) Bliss #305, 100 ton, Late.
(2) Bliss #6, 125 ton, Late.
Clearing—200 Ton (1943)
Bliss #310—440 Ton
(1) Lake Erie, 750 ton, Hydraulic, Bed 72"x146" single or dble action, Late.
SHEARS—Niagara 10'x10 G. gap
Barth (New) 54"x14 G.
WELDERS—(New) Sterling 10, 30 KVA. Bargain.

KINGS COUNTY MACHINERY EXCHANGE
408 Atlantic Ave., Brooklyn 17, N. Y.
Dept. "A"
Phone: TRiangle 5-5237

36"x25' cc Niles Bement Pond GH Lathe
13"x30' cc Pratt & Whitney "B" Tool Room Lathes
#3R Gisholt Universal Turret Lathe
#2 and #3 Warner & Swasey Turret Lathes
36"x36"x12' W&P Planer, 4 heads
32"x32"x10' Whitcomb Planer, 2 heads
Model 40-10 DUAL Steel Press Brake 10'-14-ga.

HAZARD BROWNELL MACHINE TOOLS INC.
350 Waterman St., Providence, R. I.

LATEST TYPE 1947 MACHINES
Attractively priced
FOR IMMEDIATE DELIVERY

WARNER & SWASEY No. 4A heavy duty Universal Turret Lathe; Saddle Type, 8" hole thru spindle, bar and chucking work; TIMKEN bearing, Model M—1500
Serial No. 1,027,178—built 1947

FOSDICK #42 "Precision" Jig Borer—size of table 44"x22", for precision boring and drilling on jigs, fixtures and production parts
Serial No. 14,999—built 1947

MOREY MACHINERY CO., Inc.
410 Broome St., New York 13, N. Y.
Telephone: CAnal 6-5360
Cable Address: WOODWORK. N. Y.

2—Lodge & Shipley Duomatic lathes
2—Potter & Johnston #5 DE Chucking machines
1—D. E. Whiton #18 gear cutter
1—Monarch Lathe, 22 x 48"
1—3 spindle Gould & Eberhardt spur gear and bevel roughor
1—Heald double spindle Borematic

SIER-BATH GEAR & PUMP CO., INC.
9252 Hudson Boulevard, North Bergen, N. J.

POWER PRESSES

BLISS, TOLEDO, V & O, ETC.
REBUILT — GUARANTEED

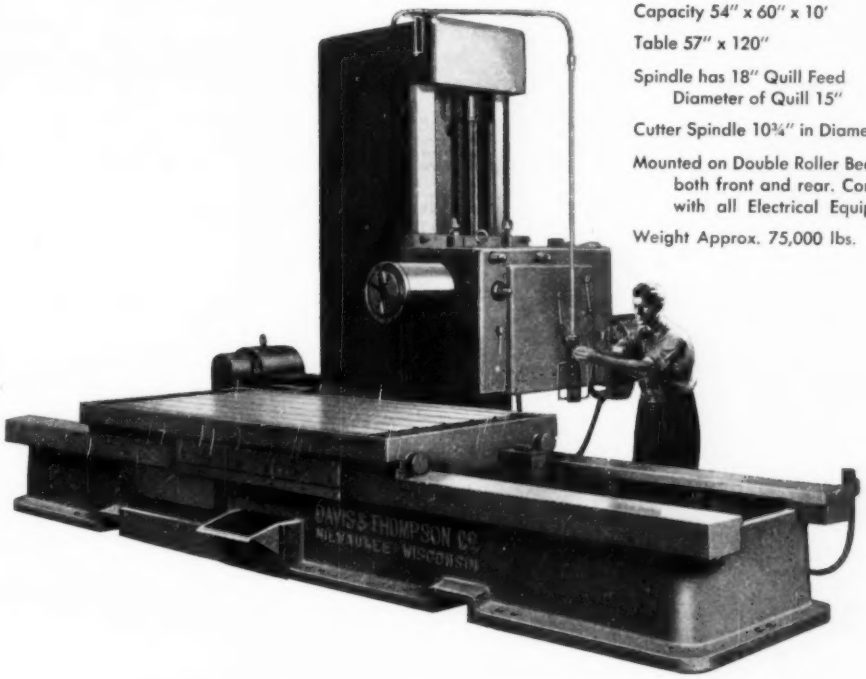
MONA MEMBER

JOSEPH HYMAN & SONS
Tioga, Livingston and Almond Streets
Philadelphia, Pa.

EMERMAN *Offers from* STOCK

PLANER TYPE MILLS

DAVIS AND THOMPSON PLANER TYPE MILLING MACHINE



Capacity 54" x 60" x 10'

Table 57" x 120"

Spindle has 18" Quill Feed
Diameter of Quill 15"

Cutter Spindle 10¾" in Diameter

Mounted on Double Roller Bearings, both front and rear. Complete with all Electrical Equipment.

Weight Approx. 75,000 lbs.

36" SERIES CINCINNATI — HORIZONTAL HYDRO-TEL

Table Working Surface 36" x 93". Spindle Speeds (16) 12—720 RPM.
Max. Spindle Nose to Table 48".

48" x 48" x 10' INGERSOLL OPENSIDE VERTICAL MILLING & BORING MACHINE

Table Working Surface 48" x 10'. Wt. Approx. 50,000 lbs.

ADDITIONAL INGERSOLLS

72" x 64" x 14' Ingersoll Planer Type Heads (Right Angle Milling Head).
30" x 24" x 14' Ingersoll 2 Heads. 24" x 24" x 12' Ingersoll 3 Heads.

EMERMAN MACHINERY CORP.

875 W. 120TH STREET • CHICAGO 43, ILLINOIS

AUTOMATICS

No. 16 New Britain 6 spdl. chucking
No. 454 New Britain chucking
14"x19" Fay Chucking
8" Bullard 6 spindle Mult-Au-Matic
½", No. 0G Brown & Sharpe
⅝" Acme Gridley Model R6
⅞" & 1¼" Cone 4 spindle
1" Economy shaver, hopper feed
1⅛" Cleveland 4 spindle
1⅜" New Britain, Model 61
1⅞" Conomatic 8 spindle
2"x18" Cleveland Model B
2⅛" Acme Gridley Model RA6

BORING MILLS

100" Niles Bement Pond vertical
52" King vertical
24", 30" & 42" Bullard vertical
2½" bar, No. 25 Giddings & Lewis
3" bar, No. 3A Universal
3¼" bar, No. 5A Defiance
3¼" bar, No. 32 Lucas
5" bar Jones, planer table type
Nos. 112B & 2112 Excello precision
Nos. 42, 47A & 48A Heald Boremastic

GRINDERS

10"x72" Colonial broach grinder
Nos. 33 & 35 Excello thread
Nos. 1 & 2 Brown & Sharpe univ.
10"x24" Landis hydr. universal
No. 2 Norton univ. tool & cutter
26", No. 226 Gardner disc
53", No. 372 Besly horiz. disc
No. 115 Gardner opposed disc
No. 230 Hanchett opposed disc
No. 2 Cincinnati centerless
No. 510 Oliver drill grinder
Nos. 6G & 10G Sellers drill grinders
Norton, 6"x18", 10"x36" & 23"x36"
Landis 6"x18", 14"x36"
No. 2B Brown & Sharpe surface
12"x48" Thompson surface
14"x60" Mattison surface
No. 34 Abrasive surface
18" & 24", No. 25A Heald surface
12" & 18", No. 22 Heald surface
Nos. 72A3, 72A5, 74 Heald internal
No. 72A3 Heald Sizematic
No. 72A3 Heald Sizematic centerless
Nos. 16A16, 16-2B, 16-3B & 24-3B Bryant

LATHES

36"x18' Bridgeford
25"x48" centers Leblond
20"x8' Lodge & Shipley
18"x8' Rockford
16"x30" centers Monarch
16"x5' Sebastian
14"x8' Lodge & Shipley

LATHES, TURRET

Nos. 2, 4, 5, 1A & 3A Warner & Swasey
Nos. 5 & 7 Bardons & Oliver
Nos. 3, 4 & 3AL Gisholt
24" & 42" Bullard vertical
No. 62 Denver
No. 4 Midland
No. 2G & 3 Morey
3"x36" & 4"x34" Jones & Lamson

SHAPERS & PLANERS

6" Pratt & Whitney vert. shaper
16" Bement Miles slotter
16", 20", 24" & 28" G&E shapers
28" & 34" Gomco univ. shapers
24" Columbia univ. shaper
30"x24"x8' Liberty openside planer

SHEET METAL TOOLS

8'x¼" Cincinnati press brake
8' x 10 ga. Dreis & Krump leaf brake
10' x 14 ga. Dreis & Krump leaf brake
8' x 10 ga. Beloit bending roll
No. 202½ V. & O. thread roller
72" x 14 ga. Wysong & Miles shear
60", 14 ga. Pettingell rotary shear
Nos. P1, P2, P3, P4, P5 Ferracute presses
Nos. 18 & 18 Bliss OBI presses
No. 6 American Can OBI press

MILES MACHINERY CO.
SAGINAW, MICH.

WHERE YOUR DOLLARS Go Further

LATHES

Bridgeford 36"x36' Gr. Hd., 48' C. Dist., 15 speeds, mtsd. carriage, taper attachment
Niles-Bement-Pond 48"x24' Gr. Hd., 15' C. Dist., mtsd. carriage, D.C. motor drive.
Reed-Prentice 18"x8', "AA", 16-speed Gr. Hd. (1945)
Reed-Prentice 18"x8', "B", 16-speed, Gr. Hd. (1942)
Pratt & Whitney 16"x36", "B", 8-speed, Gr. Hd.

UNIV. MILLERS

Brown & Sharpe #2 Light Type, Vert. Head attchmts.
Cinn. #3S Rect. Over., motor-in-base, Vert. Hd., attchmts.
Milwaukee #2 Standard Dbl. Over., motor-in-base, Vert. Hd., attchmts.
Van Norman 22-L Ram Type, Slotting attchmt. complete with Univ. equip.

PLAIN MILLERS

Brown & Sharpe #2 Light Type
Cinn. #3 Dial Type, Hi-Speed
Brown & Sharpe #3B Standard Dbl. Over., motor-in-base

Milwaukee #3B Double Overarm M.D., Table Work Surface 70"x15"—long, auto. travel table 43"

GRINDERS

Farrel 30"x182" M.D., Roll Grinder—30" Max. Roll—9" Min. Roll 182" Max. Face of Roll that can be ground—Floor space 26'x10' Nt. Wt. approx. 31000#.

Cinn. 12"x24" and 12"x36" Univ., Hydraulic, with attchmts (late)
Brown & Sharpe #2 Light Type, Vert. Head, Universal (late)
Cinn. #2 Centerless Filmatic Bearing, long bar & auto. infeed attchmts.
Blanchard #11 Rotary Surface, 16" chuck (late)
Blanchard #16, 18" chuck, 25-HP M.D.
Blanchard #16A, 30" chuck, Hand Loading Type, 30-HP Drive

BORING MILLS (Table Type)

Universal 4" bar "Triway", added vertical range
Defiance 25A, 3¼" bar, added vertical & cross range
Defiance #5, 3" bar 1942
Yoder 3A, 3" bar (late)
Giddings & Lewis #0, 3" bar, M.D.

PRESSES

Toledo #59, 250-ton, Bt. Sided, Dbl. Gr., 4-pc. Tie Rod Constr., M.D., 18" stroke
Billings & Spencer #2 Trimming, M.D., 3½" stroke, Side Shear
Farquhar 100-ton Hydraulic Drawing, 26" stroke (late)

AUTOMATIC CHUCKING & SAW

Cleveland model-A, 2½" single spindle, (quantity of tooling) 1943

Potter & Johnston #5DEL Automatic Chucker, 30" swing over ways, turret slide travel 16", 5 face turret. (late)
Potter & Johnston 6DRE Automatic Chucker, 34" swing over ways, turret slide travel 18", 5 face turret, Timken bearing.

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LATE TYPE MACHINE TOOLS

AUTOMATICS

6" RPA—8 Spindle Acme Gridley Chucker, 1941.
16" Bullard Mult-Au-Matic, 6 spindle Type D, 1941.
1⅝" Greenlee, 6 spindle, 1942.
9/16" RA-6 Acme Gridley, 1942.

BORING MACHINES

No. 42 Lucas Horiz. Boring Mill, 1940.
No. 54 Excello Way Type Double End, 1940.
No. 49 Heald "Boremastic", 1942.

BROACHES

No. CPC-30 Lapointe Vertical, 1941.
No. V-2 American Vertical, 1943.

DRILLS, HEAVY DUTY

25" Fosdick "Economax, 1941.
No. 121 Baker, 1941.
W-6 Brush Hyd. Multiple Spindle, 1943.

DRILLS, RADIAL

4'11" American Hole Wizard, 1943.
4'9" Cincinnati Bickford, 1944.
3'9" Cincinnati Bickford, 1946.

GEAR EQUIPMENT

No. 12B Gleason Gear Rougher, 1943.
3" Gleason Gear Generator, 1942.
No. 6 & 17 Gleason Gear Testers, 1943.
12" Red Ring Internal Gear Shaver, Late.
No. GCL-3 Red Ring Gear Shaper, 1942.
No. 7125A Fellows Gear Shaper, 1943.
Vinco Spline & Gear Grinder, 1942.

GRINDERS, CYLINDRICAL

16"x36" Cincinnati Plain, 1942.
12"x48" Cincinnati Universal, 1943.
10"x72" Landis Type C Plain, 1942.

GRINDERS, INTERNAL

No. 74A Heald Extended Bridge, 1941.
No. 72A3 & A5 Heald Plain, 1944.
No. 16A22 Bryant Hole & Face, Late.

GRINDERS, SURFACE

14"x36" Pratt & Whitney Vertical, 1938
No. 22 & 25A Heald Rotary, 1943.
No. A1-8 Arter Rotary, 1942.

LATHES, ENGINE

42"x192" Axelson, 1942.
24"x158" Sidney, 1942.
18"x54" Lodge & Shipley, 1943.
14"x78" Reed Prentice, 1942.
14"x30" Lodge & Shipley, 1943.

LATHES, PRODUCTION

20"x25" Fay Automatic, 1942.
10"x22" Sundstrand, Model 10, 1942.
12"x18" Lipe "Carbo", Late.
14"x42" Monarch "Magna Matic", 1941.
2FU Foster Fastermatic, 1943.

LATHES, TURRET

36" Bullard Vertical, 1940.
No. 2A & 3A Warner & Swasey, 1943.
No. 9A Jones & Lamson, 1942.
No. 3L Gisholt, 1941.
No. 2, 3, 4 & 5 Warner & Swasey, 1943.
8½"x24" Acme Universal, 1943.

MILLS, PLAIN

No. 5 Cincinnati High Power, 1943.
No. 4H & 4K Milwaukee, 1943.
No. 3 Van Norman Plain, 1942.
No. 2HL Milwaukee, 1942.

MILLS, PRODUCTION

No. BL-2420 P & W "Keller", 3 spindle, 1942.
No. BL-2416 P & W "Keller", 1 spindle, 1943.
No. BG-1 "Keller", single spindle.
No. 4-36 & 4-48 Cin. "Hydromatics", 1943.
No. 1248 Milwaukee "Simplex", 1942.
No. 1-18 & 2-18 Cincinnati, 1942.

MILLS, THREAD

6"x60" Pratt & Whitney, Latest.
12"x54" Lees Bradner, 1942.
8"x16" Hanson-Whitney, Late.

MILLS, UNIVERSAL

No. 2L & 2MH Cincinnati, 1942.
No. 2H Milwaukee, 1942.
No. 2SSU Van Norman, 1942.

MILLS, VERTICAL

No 3H & 3K Milwaukee, 1942.
No. 2K Milwaukee, 1942.
No. 2 & 3 Cincinnati, 1941.

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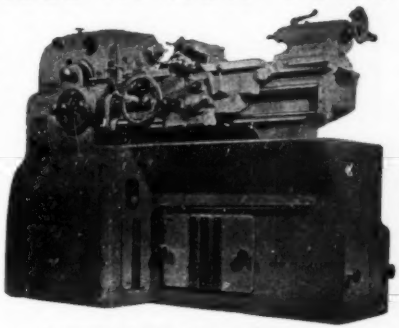

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KING 62", 2 swivel heads, PRT, M.D.
NILES 100", 2 swivel heads, PRT, DC, M.D.

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AMERICAN 4' arm 11" column, "Hole Wizard", latest
LELAND & GIFFORD #1LMS, 4 spindle, latest
LELAND & GIFFORD #2LMS, 6 spindle, latest

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FELLOWS #2[1], #6Z2, Gear Shaper, latest
GLEASON 3", 12" straight bevel generator, Latest
GOULD & EBERHARDT #12H, Hobber, Latest
GOULD & EBERHARDT #36H, Hobber, with diff., M.D.

GRINDERS—Cyl.—Plain & Univ.

BROWN & SHARPE #1, 2, 3, 4, Universal, Latest
LANDIS 4x12, Type H Plain Hyd., Latest
NORTON 6x18", 10x72", 14x36", Type C, Plain, latest
NORTON 6x30", 10x36" type C, Plain Hydr., Latest

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BRYANT #16-CP-16, #24 Int. Hyd., latest
CINCINNATI #2 Centerless "Filmatic", latest
CINCINNATI Centerless Lapper, Model ED, Latest
COVEL #22 Universal Tool & Cutter, Latest Type
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MONARCH 10x20" centers, Model EE, Timken, latest
MONARCH 16"x78" centers, Timken, Latest type
MONARCH 22"x456" centers, Timken, M.D.
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GISHOLT #1L, #2L, #3L Universal, Timken, Latest
GISHOLT #3, #4 Univ., TIMKEN, Latest Type
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KEMPSMITH #3G, Timken, latest type
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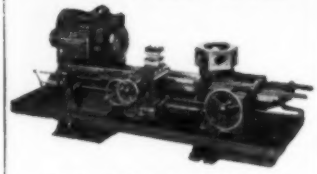

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No. 5 BARDONS & OLIVER Turret Lathe, bar, chucking, taper attachment, 1942
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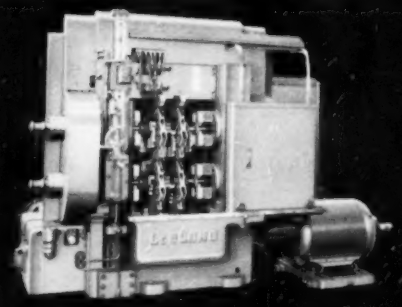

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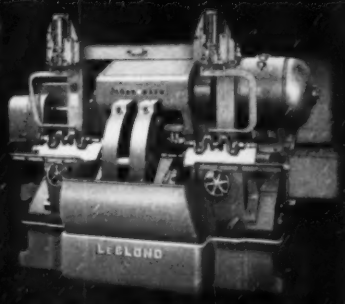

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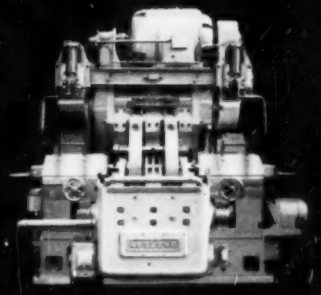

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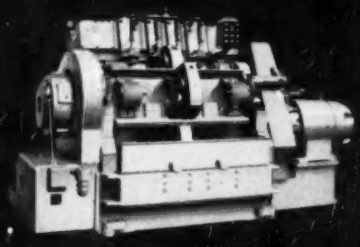

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